ELECTRICAL REVIEW

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IN THIS ISSUE

The E.R.A.	277
North Wales Power. *By J. Warnock, M.I.Struct.E., A.M.Inst.C.E.*	279
Equipment for Canada	284
Welding Exhibition	285
Correspondence	286
Power System Frequency	287
Meter Testing. *By J. T. Victor, B.Sc., A.M.I.E.E.*	289
Cooling Gas Turbines	290
The Year's Progress	291
Recent Introductions	293
E.R.A. Annual Meeting	297
Personal and Social	298
Oil Jetty Lighting	301
Ship Propulsion	310
Rectifiers and Chargers	314
Australian Imports	316
Next Week's Events	318
Classified Advertisements	75
Index to Advertisers	90

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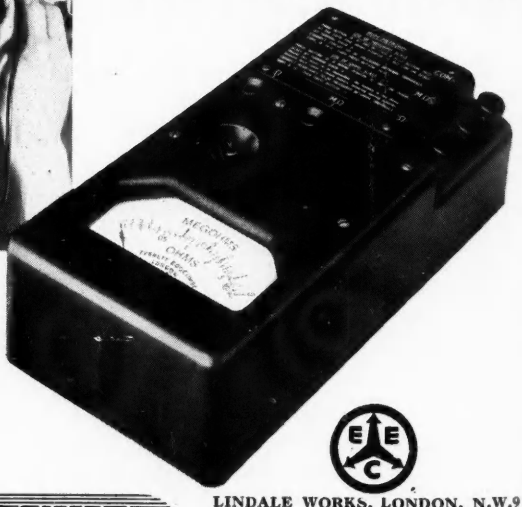

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ELECTRICAL REVIEW

Vol. CXLVI No. 3769 17TH FEBRUARY, 1950

THE OLDEST ELECTRICAL PAPER • ESTABLISHED 1872

The E.R.A.

INCREASING INCOME WILL ENLARGE OBLIGATIONS

SATISFACTION with the outcome of negotiations which will steadily increase the income of the British Electrical and Allied Industries' Research Association (E.R.A.) must be tempered with caution. It is true that substantially larger funds are being made available—and will be forthcoming more promptly—so that the adverse balance has been redressed.

Nevertheless, the financial stringency can only be said to be temporarily relieved, for it must be borne in mind that the Association never has had large enough reserves for working capital. Also both special contributions and increased general support place the Association under an obligation correspondingly to expand the services it renders. This it will not be able to do if it lacks funds or facilities.

Inadequate Accommodation

The accommodation available is already inadequate; it is now necessary urgently to reconsider the provision of suitable buildings which will afford a wider scope for the progressively increasing activities. So the plans for the projected Leatherhead establishment, commenced in 1944 and deferred by the reorganization of the supply section of the industry, have been brought forward again to a stage at which, in view of the agreements about income, proposals can be framed—on a more modest scale than previously—for rehousing.

It is the new president's wish, as he declared at the annual luncheon last week, that the decision should be reached this year and one may add the hope that those who make it will not be unmindful of the future staffing of these laboratories. A small addition of staff was possible last year. Scientific workers are becoming more readily available, but the right type is not easily found, while the highest quality is likely to remain limited. The turnover of senior staff is relatively small, which is understandable; the loss of junior staff to industry and Government establishments is appropriate to the self-imposed E.R.A. function of training young people in electrical science and is believed to be appreciated.

"Drift" to Universities

A further comment may, however, usefully be quoted from the annual report as a straw to show how the wind is blowing. It is that a rather disproportionate number of those who leave go to university appointments and fellowships. This, one must agree, seems the wrong direction and to betoken an attitude which may be disadvantageous to the national economy, though perhaps not avoidable in a period of rapid expansion of the universities.

The E.R.A. is not alone in its dislike of this drift, if that is the right word, for it has been observed with some concern at another large centre of research. The advisory committee structure which the

E.R.A. has deliberately built up during the past thirty years can do much to diminish the migration. It is a system with which the principal guest at the annual luncheon last week (Professor Sir Lawrence Bragg) found himself in hearty agreement. But he went even further by advocating another way of helping to remove that sense of frustration, shall we say, which is apt to be felt by the investigator who, longing to try that "long shot in the dark" which occasionally hits the target, finds himself enmeshed in the pressing details of practical purpose.

EXPERT MAINTENANCE

Most factories of any size employ one or more maintenance engineers to keep the plant in good order. Often, however, these are mechanical engineers with incomplete knowledge of electrical matters. Other, smaller, concerns cannot carry special maintenance staff and the work is done, if at all, by anybody who happens to be available. In such cases the engagement of a qualified electrical contractor is worth while, and the expense is recouped by increased efficiency and the avoidance of breakdowns. The subject is one which the Electrical Contractors' Association has been keeping before its members. It has now produced a little illustrated folder for their use, setting forth convincing arguments in favour of the practice. It should prove very useful in securing this class of business.

AMERICAN UTILITIES' STOCKS

Figures obtained by the *Electrical World* (New York) from fourteen representative electrical utilities show that their purchases of distribution material last year cost about $66 million as compared with $74 million in 1948. Among the chief items, watthour meters were down by 30.9 per cent, poles by 20.2 per cent and distribution transformers by 6.5 per cent. It seems that this does not indicate "recession" but merely a reduction of stocks. In the immediate post-war period the companies anxiously bought all they could when they could. Now that the supply position is easier (there is a buyers' market) they are returning to purchasing as they need. The result is that stocks have been run down to an average of four months' supply from a level as high as 18 months' supply in 1948.

TRANSATLANTIC TRADE

Sir Cecil Weir, chairman of the Dollar Exports Board, has reiterated the belief that there is plenty of scope in Canada for British exporters of engineering equipment. A recent manifestation of this is the capture of a $5 million contract by a British company for mechanical handling equipment. It is emphasized that personal visits of principals and the exercise of expert salesmanship are necessary to secure results. The Board has just strengthened its executive committee by the inclusion of some well-known industrialists, including Sir Norman Kipping (director of the F.B.I.), Sir Percy Lister (chairman of R. A. Lister & Co.) and Mr. C. B. Colston (chairman and managing director of Hoover, Ltd.).

DUAL-PURPOSE POLES

It is natural for farmers and other rural residents to wonder why telephone poles carrying lines to their premises cannot also be used for an electricity service. The question has been raised in the South Western Area where the Board's information officer (Mr. B. G. Murray) has said that wherever practicable the Board and Post Office come to an arrangement. But it is only in special cases that it can be done. Nothing over 250 V is considered safe; the current has to be cut when G.P.O. linesmen want to work on the poles; and there is often no available space on telephone poles. Whenever possible the Board will carry out joint construction with the Post Office, although it is thought that in general there is comparatively little scope for it.

RURAL ELECTRICITY

The *Electrical Review* of the 17th March will be devoted largely to rural electrification. Authoritative articles will cover various aspects of the subject, presenting the views of farmers, contractors and the Electricity Boards.

North Wales Power

Financial Aspects and Proposed Lay-out

By J. WARNOCK,* M.C., M.I.Struct.E., A.M.Inst.C.E.

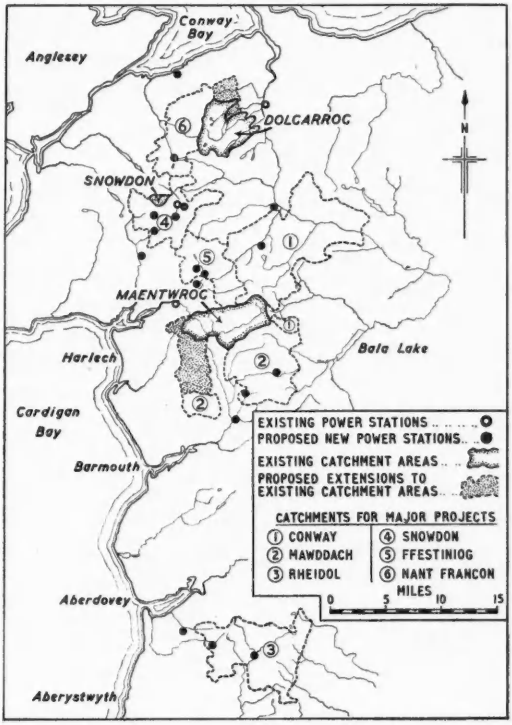
A GENERAL statement by the Divisional Controller has already been published† on the proposals inherited by the British Electricity Authority for extending hydro-electric schemes in North Wales in order to utilize the latent water power resources of that mountainous region.

This article deals with the financial aspects and makes some general observations on the proposed lay-out and sequence of development in the more important areas. An endeavour is also made to clear up certain misconceptions about the amenity aspect of these water power proposals which has received considerable prominence recently.

When promoting a hydro-electric project, or any scheme for generating power, the first criterion to be satisfied is the financial one. Whether a scheme can be justified depends, to a great extent, on costs. The principal justification for developing electric power by utilizing a pressure head of water (in addition to a probable saving in cost/kWh generated) is the saving in coal thereby made. The cost of coal used in modern steam stations at the present time averages 0.4d/kWh generated and there is no likelihood that it will decrease by any material extent. In a hydro-scheme operating at a load factor of 20 per cent, which is the general average for peak load stations, the power generated is equivalent annually to 1,750 kWh/kW of generating capacity of the plant. The equivalent coal cost of this output at 0.4d/kWh is £2.9 which figure, therefore, represents the value of the coal to be saved per kW of plant installed. If this reduction of coal cost is evaluated against the capital cost of the heavy civil engineering works of a hydro-electric scheme to meet payment of in-

* Divisional Hydro-Electric Engineer, Merseyside and North Wales Division, B.E.A.

† *Electrical Review*, 27th January, 1950



Key map of major North Wales projects and the proposed extensions of existing stations

General view of Nant Gwynant with the Cwm Dyli hydro-electric power station (which is indicated by the arrow) and Llyn Gwynant at the bottom of the valley looking west of south

terest and sinking fund charges on the usual 80 years of life basis, it will approximate to the annual cost of civil works at a value of some £87/kW of plant installed on a basis of yearly interest charges of 3%. As a general rule the actual cost of the heavy hydraulic works on an average scheme is less than this figure, although relative costs may differ widely, depending on the physical characteristics of the various projects. It is suggested that the value of heavy civil hydro-works of £87, as stated, can be added to the average cost of the complete steam power generation plant to indicate the maximum cost of a hydro-electric installation which might be justified as being able to compete on an economical basis with a steam station. The steam station value, on average, might be taken at £50/kW, so that it would appear that hydro-plants costing up to about £137/kW might be installed and still be an economic proposition able to compete on a generated kWh cost basis with steam power stations.

The advantage on the heavy hydro-structural works side is their comparatively long life with relatively low maintenance cost. The actual life of heavy civil engineering works associated with water power generation is not known and an 80 years' life (the present interest and sinking fund basis) need not be the limit of the useful term of such works.

Operating costs of the two types of generation will not differ very much if one includes running and general maintenance costs, bearing in mind that the steam plant works at a higher load factor. These costs at the present time will be of the average order of 0.075d to 0.080d per kWh generated.

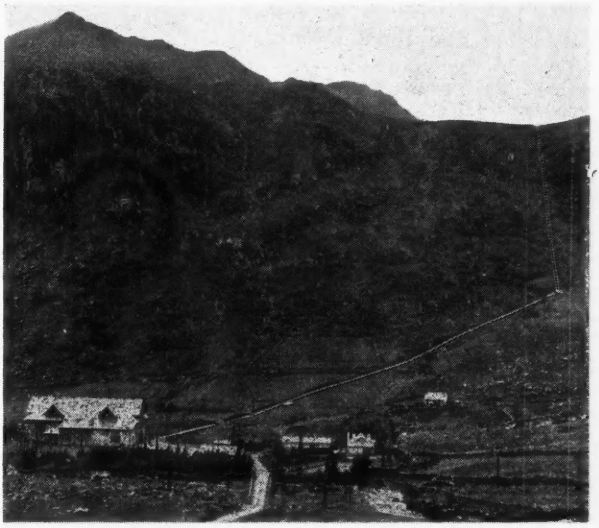
The advantage on the whole on the

above brief analysis of relative costs evidently rests with hydro-generated energy, because the average cost of the provision of hydro-electric works will be considerably less on favourable sites than the suggested figure of £137/kW of plant installed. In taking a value for steam plant of £50/kW, it has to be remembered that the first cost of this plant also depends on site works involved and can, in cases, materially exceed the £50/kW chosen for our comparison of costs. It has also to be remembered that hydro-power is an inexhaustible commodity and to all intents and purposes is available for all time.

Fears about amenity which have been given considerable prominence in connection with the British Electricity Authority's tentative proposals for further hydro-electric development in North Wales are quite clearly based on a lack of knowledge of the character of the works required for electricity generation by water power. Certain hydro-electric works now exist in North Wales, but it is not reasonable in every case to take existing examples as representative, or typical, of new installations. In earlier years much less regard was probably paid to the preservation of amenities in the countryside than now appears to be necessary in laying down new plant.

A point which is not appreciated in connection with hydro-schemes generally is the comparatively large area of a country covered by one project in relation to the physical size of the individual parts of the works. Such works, as viewed in a general landscape, are not, as a rule, obtrusive on the general view. The individual parts tend, in a short period of years, to blend in with nature while those parts of relative larger size would, as a general rule, be designed æsthetically to fit in, so far as possible, with that part of the landscape which they occupy.

Consider how the principal individual works comprising a typical scheme are in general related to the scenic conditions of a countryside. In the higher elevated areas the greater part of the flow from the streams is collected by weirs of stone or concrete erected across the streams. From these weirs, leets (small canals to convey the diverted water to storage basins) will follow generally the contour line on a hillside and collect further water draining into them from the hill areas. These leets, some 2 to 5ft in depth and in widths from some 9 to 16ft or larger in isolated cases, will in a very few years after their construction be practically hidden from view by growth of vegetation on their banks and from a moderate distance be hardly visible in the general landscape. It is a fact that existing leets can, in general, hardly be distinguished from the stone dykes running along a typical hillside.



This photograph of the Cwm Dyli power station was published in the *Electrical Review* dated 24th November, 1933. The pressure pipe-line then visible has now been completely covered. (See opposite page)

Such water collection by leets does not deprive the ground areas on the low side of the leets of the water required for cultivation and general plant growth. Land depends for its moisture on direct rainfall and on dew in summer. Any surplus of rainfall, not held up for a period by vegetation, finds its way directly to ditches and thence to streams and is, therefore, lost to the land.

The usual hydro-electric scheme, apart from the run-of-river plants, depends on natural lakes or artificial reservoirs laid down in suitable positions for the necessary storage of the day-to-day supply of operating water. Considerable attention is given æsthetically nowadays to the construction of dams so that, when completed, they can be pleasing to the eye. A choice of construction may be available in given cases. Dams with artistic merit now exist in Wales and there is no reason why the new dams tentatively proposed for hydro-electric development need be in any way less pleasing in appearance than certain well-known existing structures. The lakes which are formed do, in many cases, add to the general appearance of a valley rather than detract from it. A notable example is the typical reservoir called Lake Vyrnwy in Montgomeryshire, which forms part of the works of the Liverpool Corporation water undertaking.

Tunnelling and Rock Disposal

To make the greatest possible use of available water pressure heads, it is often expedient to divert water across a watershed to an adjacent gathering ground by making use of a tunnel bored through an intervening hill. Tunnelling will also be necessary in many cases for the final pressure water feed from the main storage reservoir to the power station situated, it may be, in an adjoining valley. Much point has been given in the general argument against hydro-electric schemes to the disposal of the rock spoil excavated from tunnels. The problem of effective disposal, so that local amenities will not be interfered with, is sometimes difficult, but can generally be overcome. As a rule, the positions of tunnels, in order to preserve effective operating heads, are high and may often be in natural rock-strewn areas. Where tunnels are required at lower elevations in areas of grass lands and richer vegetation, spoil disposal becomes more complicated and calls for such special measures as suitable contouring of the selected areas and careful surface treatment.

Pipe lines are in general associated with the final pressure stage leading to a power station. If conditions of terrain permit, the pipe lines can be placed at levels below average ground surface and their line of route camouflaged by tree planting. Pipes lines above ground level can also be screened from view by belts of trees, examples of which treatment exist in North Wales and elsewhere.

Harmonizing with Surroundings

The final part is the power station itself, situated, as a rule, on the valley floor adjacent to a stream, or main river, or to an arm of the sea. Great efforts have been made in times past, by good design and layout, to make the power stations look attractive and fit harmoniously into their surroundings. Success in this respect has undoubtedly been attained in many cases by attention to the general mass dimensions, window arrangement, etc., allied to suitable texture of outer-wall surfaces.

Of the hydro-electric proposals in North Wales, the scheme evoking the greatest amount of discussion at the present time is probably the Snowdon project for which the water run-off from the main Snowdonia Range has to be utilized. The small Cwm Dyli station on the easterly slope of Snowdon has been generating power since 1906. It utilizes water run-off from an area of about 1¾ square miles collected in Llyn Llydaw and operates at a gross head of about 1,120ft with some 5,000 kW of generating plant. On account of high rainfall in the area, reaching in some seasons about 190 inches in the year, this station has a very high generated power output per unit of catchment area.

Under the new proposals for this area, which envisage a total of five power stations Llyn Llydaw would feed a new power station beyond the range to the south of this lake, while the existing Cwm Dyli station would obtain pressure water from the Glyder Range, further to the north, to operate at a lesser gross head. It is suggested, in the proposed arrangements,

that the new station associated with Llyn Llydaw should also operate as a pumped storage station. Through pumps associated with the generators, it would be possible to pump water back to Llydaw from its own ponded discharge associated, for the collection of additional water for pumping, with a further collecting reservoir in the same area at about the same level of location. Where surplus water run-off is likely to occur from an adjacent gathering ground, an advantage to be gained by this arrangement would be the availability of additional power over peak-load periods at some small additional kWh cost.

It is considered that this proposal for five power stations need not interfere with the Gwynant Valley, or the adjacent areas where the Afon Glaslyn follows its sinuous course through Aberglaslyn Pass, one of the acknowledged scenic areas of North Wales. The five stations would house a total generating capacity of 54,000 kW, operating at pressure heads varying between 150ft for the lowest station near Aberglaslyn, to 900ft. For all of the stations mentioned reaction turbine plant would probably be used.

To the north of Snowdon, a proposed generation scheme is based on the use of the long narrow pass of the Nant Ffrancon (through which runs the London-Holyhead Road) as the site of a main storage reservoir. A small station to utilize the run-off collected by leet and tunnel from the adjacent hills would be at the top of the Pass to operate at a gross head of about 270ft out of Llyn Ogwen, while the main station would be on the seaboard of Conway Bay, operating through some 7½ miles of tunnel from the Nant Ffrancon reservoir at a gross head of some 670ft. The total generating capacity of this scheme would be about 35,000 kW.

East of Nant Ffrancon and on the easterly slope of the Carnedd Range, it is proposed to extend the water gathering ground for the existing Dolgarrog scheme discharging into the River Conway with a northern drainage boundary on Taly-Fan, south of Conway Bay.

On the upper reaches of the River Conway, a scheme to utilize the run-off from the higher hills in the area up to elevations of some 2,500ft would comprise two power stations, each of 30,000 kW at gross heads of about 800 and 400ft respectively.

To the west of this scheme and taking its power water from an extension of the same high hill ground in the vicinity of Blaenau Ffestiniog, a further scheme will utilize pressure water through three power stations with a final discharge to the Afon Dwyryd. The total generating capacity would be about 27,000 kW at gross pressure heads varying from 180 to 520ft.

For the Maentwrog scheme laid down in 1928, an extension of water gathering ground by about 14 square miles south and west of the present Trawsfynydd Lake storage reservoir would raise the load factor of this station, under average operating conditions, to over 25 per cent. No addition to generating plant is proposed in the station.

To the south-east of Trawsfynydd Lake, a project on the high ground drained by the Afon Mawddach and its tributaries, in an area of about 43 square miles, would be in three stages of development from an upper reservoir at over 1,400ft elevation to near sea level. The total plant in three stations would

TABLE I

Principal Particulars of Existing and Projected Schemes.

Project	Dolgarrog	Maentwrog	Nant Ffrancon	Conway	Ffestiniog	Snowdon	Mawddach	Rheidol
Catchment, sq. miles ...	22 plus 5 in extension	23 plus 14 in extension	26	79	25	28	43	49
No. of stations ...	1†	1	2	2	3	5*	3	3
Aggregate head, feet ...	1,180	630	900	1,150	1,010	1,370	1,300	1,170
Average annual output million kWh ...	53	52	61	108	45	89	89	128
Plant, kW	18,000	24,000	35,000	60,000	27,000	54,000	54,000	78,000

* Includes existing Cwm Dyli power station.

† Two plants, high and medium heads.

be 54,000 kW with gross operating heads between 445 and 470ft.

To augment resources over peak load periods, it is proposed in this project that the top stage station should also operate as a pumped storage plant, the pumps associated with the generators being arranged to lift water back to main storage, using generated power from a lower station in the scheme.

One further major scheme is projected in Cardiganshire, some 25 miles to the south of the Mawddach project, based on the high ground of Plynlimon. This is the largest of the proposals for development, with 78,000 kW of generating plant in three stations collecting pressure water over a gathering ground area of about 50 square miles. The gross operating heads vary between 180 and 580ft; water would be collected by tunnel and leet from both the east and west slopes of Plynlimon and eventually discharged at sea level to the River Dovey estuary across the intervening watershed.

If all these proposals, which are at the moment purely tentative, were adopted the total capacity of hydro-generating plant in North Wales would aggregate some 350,000 kW and be able to produce about 625 million kWh in an average year. Particulars of the existing and proposed schemes are given in Table 1 on the preceding page.

In the constructional works required for the proposed six main schemes the following approximate lengths of water conduit would be necessary: 41 miles of leets of varying size and 85 miles of pressure and non-pressure tunnels.

The normal period for completion of a hydro-electric scheme of average size is three to four years. In North Wales it is anticipated that the schemes would be undertaken in a general order of priority and that construction would proceed on probably two or three complete schemes simultaneously. The whole programme should occupy about 10 years.

The proposed augmentation of power in Wales would be obtained from nature's own resources and it is certain that the Welsh people would derive from it great and lasting benefit. Nor should the developments as proposed in any way impair the beauty of the Welsh landscapes.

EQUIPMENT FOR CANADA

Conforming with Requirements

WE reported in December that agreement had been reached upon proposals that electrical equipment destined for Canada should undergo preliminary tests in London to ensure that it conformed with the requirements of the Canadian Standards Association. This agreement resulted from the work of the mission headed by Mr. D. M. Buist (B.E.A.M.A.) and comprising Mr. T. M. H. Stubbs (B.E.A.M.A.), Sir Holland Goddard and Mr. W. L. Sims nominated by the Machine Tool Trades Association, Mr. T. S. Carter (nominated by the Cable Makers' Association), Mr. J. O. Knowles (Brookhirst Switchgear, Ltd.) and Mr. J. F. Stanley (assistant technical director, B.S.I.), which visited Canada towards the end of last year.

The British Standards Institution (24-28, Victoria Street, S.W.1) has now issued the Mission's report, copies of which are available free of charge (ref. CK(ELE) 8979). It covers in brief detail the inspection methods adopted by Canadian Provincial authorities; the origin and scope of the C.S.A. approvals system; and the present position of the British electrical manufacturer. Mention is made of the various Government representatives and other interested officials with whom the Mission had discussions and of the meetings which were held with the C.S.A. Approvals Administrative Board and Executive Committee.

The agreement arrived at between the C.S.A. and the B.S.I. was in the following form:—The B.S.I. will be empowered by the C.S.A. to receive applications from British manufacturers for C.S.A. approval, and the B.S.I. will notify the C.S.A. of these applications. The C.S.A. will inspect the equipment and arrange for the tests required by the appropriate C.S.A. specification. These tests may take place in the United Kingdom at establishments approved by the C.S.A. on the nomination of the B.S.I. In the case of tests conducted in the United Kingdom, the B.S.I. when satisfied with the inspection and tests, will submit a report, with the necessary copies of illustrated literature or photo-

graphs for appending to copies of the Approvals Report, to the C.S.A. Approvals Division, together with application for approval. Subject to C.S.A. approval of the B.S.I. report and favourable ballot by the C.S.A. Approvals Council, listed approval will be given by the C.S.A.

The B.S.I., under C.S.A. instructions, will act as the agent of the C.S.A. in connection with the reinspection procedure. All expenses will be borne by the B.S.I.

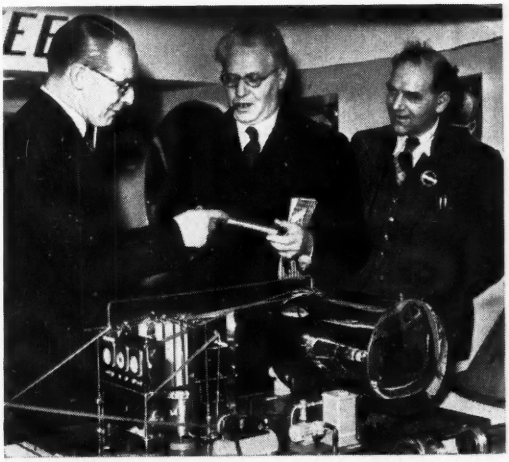
The appendix to the report lists the Canadian standards with which electrical equipment must comply.

WELDING EXHIBITION

Research and Production

LAST week Sir Ben Lockspeiser, secretary of the Department of Scientific and Industrial Research, opened a six-day exhibition of welding research and production, which had been organized at its London headquarters by the British Welding Research Association. The main purpose of this display was to direct attention to the activities of the B.W.R.A., and to illustrate the advantages of welding as an effective means of increasing productivity, economizing in the use of metal, and cutting down costs generally.

In his remarks at the opening ceremony Sir Ben stressed the importance of co-operative research in this country and, after expressing the D.S.I.R.'s high regard for the Association, he said that it certainly gave very good value to industry. He also said that the Association's present income of £57,000 was far from adequate and at least £100,000 would be required next year; this would enable still greater economies in productivity to be achieved and facilitate the furtherance of necessary research.



Sir Ben Lockspeiser (centre), secretary of the D.S.I.R. being shown a flash-welded tube by Dr. H. G. Taylor, director of research of the British Welding Research Association at last week's exhibition in London

The exhibition comprised nine stands in all, which had been designed and constructed by the staff of the Association to represent the various aspects of the Association's work and to indicate the scope of its activities. A prominent feature of the resistance welding stand, for example, was a spot welding machine with ignitron control panel, which was in operation to demonstrate instruments which have been developed by the Association for measuring the machine variables in resistance welding.

Other exhibits explained the use of various metals in welding and illustrated the work which has been carried out on welded structures, pipe lines and pressure vessels, and investigations which have been made into the cracking of welds in steel.

There was also a section which dealt with the application of welding techniques to repair work, and another dealing with the non-destructive testing of welded products.

Seaside Illuminations

THE Special Illuminations Committee of Torquay Town Council recently recommended that the scheme of illuminations on the front should be extended at a cost of £6,505. A sum of £8,000 was approved last year for illuminations, said the chairman of the Finance Committee, Mr. A. Denys Phillips. Of that £3,500 was spent, which left £4,500, and now the committee proposed spending £6,500. He wanted to know where the other £2,000 was to be found. Mr. L. E. Curry contended that the illuminations as they were now had satisfied the visitors. It was possible to go too far with them. He moved reference back. This motion was defeated heavily and the Committee's recommendation was approved.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents

Welsh Water Power Proposals

IN the article on this subject in your issue of 27th January, Mr. A. R. Cooper claims that a hydro-electric station is less unsightly than a similar steam station.

While this is undoubtedly true of the two types of buildings considered apart from their surroundings, it seems hardly fair to apply this conclusion to the new Welsh proposals in which the choice is between one steam plant sited somewhere in the already developed coastal area of the district, and some eighteen hydro-electric plants with their associated civil engineering works to be built in the wildest and most beautiful parts of the proposed National Park.

T. CLUTTERBUCK.

Rickmansworth.

Load Flow Calculations

IN your issue of 23rd December I find the title "An *Original* Approach by Network Simplification." Rather a revival perhaps—at any rate it has been in use for fifteen years to my knowledge and must be much older than that. It has been developed very much further during that time; so much so in fact that so far as "supply" networks are concerned, much of the recent talk regarding the necessity for network analysers is an over-statement—they are not always essential.

Supply networks which used to baffle qualified engineers can now be solved for most practical purposes by a non-technical clerk if the latest methods are used. As proof of this I recently had a number of solutions done by a young lady who "didn't know the first thing about it." The solutions were correct and, what is just as important, were available long before the analyser (and its special operator) could have presented them. The network in that instance was one bearing sixteen loading points in four meshes. The same method has already given solutions for networks having as many as thirty-four meshes without using an analyser. Many existing analysers could not carry such a problem unless considerably extended at great cost.

G. W. MAXFIELD.

Putney, S.W.15.

Marine Radar Demonstration

A FULLY operational set of marine radar equipment has just been installed on Woodside Landing Stage, Birkenhead, by the Decca Navigator Co., Ltd., to facilitate demonstrations to local shipping concerns and also to provide training and instructional facilities for ships' officers.

Priced at £1,500 complete, this installation is claimed to be the most inexpensive of its kind in the world, thereby enabling it to be used by those shipping interests to which it has previously been denied by high cost.

On the demonstration equipment a remarkably clear picture of the Mersey can be seen from Eastham to Crosby Point, small craft and river traffic being shown in great detail.

A large number of orders have already been received for Decca radar for both British and foreign vessels, and the equipment is now being fitted at the rate of more than one ship a day.

Electricity in Film-Making

BEFORE the Association of Supervising Electrical Engineers at the Lighting Service Bureau in London recently Mr. H. Clifton delivered a lecture on the electrical equipment of a modern film studio. He commenced by discussing the studio power house and outlining the power requirements peculiar to the film-making industry. After describing some typical power-house installations and referring to possible future developments, Mr. Clifton dealt with d.c. distribution systems and said that the most important requirement here was maximum current-carrying capacity with minimum weight and voltage drop. In conclusion, the speaker dealt briefly with other film studio services such as lighting, ventilation, water, gas, steam, etc.

Power System Frequency

Discussion on I.E.E. Paper

IN last week's issue we published a report of a meeting at the Institution of Electrical Engineers in which Dr. E. Bradshaw and Mr. M. Z. Tanyeloglu (both of the Manchester College of Technology) described an instrument for the measurement and recording of power system frequency.

The subsequent discussion was opened by Mr. A. Felton (N.P.L.), who admired the way in which the authors had solved their problem by a combination of electronic and mechanical techniques, but said he was surprised at the inference that rate of change of frequency was more useful as information to the control engineer than an indication of frequency. He was also surprised that it was necessary to take the rate of change over as much as two minutes, which seemed another argument in favour of the recording of frequency.

Early Indication of Changes

Mr. J. R. Thomson (B.E.A., Manchester) said that during the last three months they had observed the instrument in operation in the Manchester grid control room. It was not kept in continuous use, but was switched on before those periods when rapidly changing load conditions normally occurred. Such an instrument, permanently installed in every control room, should be kept in service continuously to assist control engineers in the regulation of frequency. On the grid, the loadings on the inter-area tie lines were known only to the control engineers, and it was not sufficient to leave regulation to generating stations. An early appreciation by area control engineers of what adjustments in generation were required was essential and the authors' instrument would assist in cutting down the time element. Under the present conditions of generating plant shortage it would be of great assistance to the national control engineers who had to initiate load shedding.

Mr. W. L. Garfield (Standard Telephones & Cables, Ltd.) mentioned that he had been connected with the development of an instrument for the national and south-east regional control of the C.E.B. which presented an interesting comparison in technique with that of the authors. The authors held that the rate of change should be measured over an interval of 2 min, but he had found that in the part of the country with which he was concerned it could be measured over a period of 1 min, and by making the period of renewal of readings the same as that over which the readings were measured considerable simplification resulted. The instrument to which he referred had been in use since the winter of 1947 and was often consulted with regard to load shedding.

Mr. E. C. Scott (B.E.A.) said that the statutory standard of frequency control was ±1 per cent, but in order to regulate frequency on an interconnected system a much higher accuracy was required, and they asked for, and to some extent received, an accuracy of 0.1 per cent. It was desirable to make the fullest use of the grid in restricting generation to the most efficient stations, where the cost was lowest, and that necessitated a stable frequency. If it varied by only 0.1 c/s there might be fluctuations on the line of up to 15,000 kW, so it was essential to have frequency instruments which were stable and accurate to that degree. The authors' instrument made it possible to detect changes of frequency almost before they occurred, and frequency could not be maintained constant without anticipation. He hoped that measurement engineers would be able to provide a frequency meter of the required accuracy which was not too expensive.

Suggested Simplification

Mr. F. R. Axworthy (Everett Edgcumbe) pointed out that the need for the authors' instrument arose as a result of the necessity for load shedding and asked if it would still be useful when there was no shortage of generating plant. It seemed to him that the method used by the authors was unnecessarily elaborate and could in some respects be simplified. He made suggestions to this end which he felt would enable the cost of the instrument to be considerably reduced.

Dr. E. Bradshaw, in replying to the discussion, referred to the use of the instrument at other times than peak load, and said he understood that his friends in the Manchester control room liked it to be on in the early morning, when they brought new plant on, which was a normal occurrence whether there was a shortage of plant or not.

VIEWS on the NEWS

By REFLECTOR

WHAT is believed to be the only green telephone kiosk in London, although there are some in rural areas, stands near the Institution of Electrical Engineers and has been there since 1927. The colour was a concession by the G.P.O. in return for the gift by the Institution of the small piece of land on which it is situated. The idea was that it should harmonize with the small shrubbery on the corner of the Institution's site.

★ ★ ★

Although the equipment in most London theatres is now largely electrical and to that extent constitutes an advertisement for electricity it is an unobtrusive form of publicity. More forceful is the use now being made of theatre programmes by the North Thames Gas Board. I have seen nine of these for shows now running in London and find that a great deal of ingenuity has been put into the advertisements of gas cookers for which the Board has taken space. But while giving credit where it is due, my real purpose in mentioning this enterprise is to commend it to the attention of the London Electricity Board upon whose ground the Gas Board is operating.

★ ★ ★

Denying a statement by Lord Lovat that only 20 per cent of the workers on the Glen Affric scheme are Highlanders, the North of Scotland Hydro-Electric Board says that actually 80 per cent are. As to the remainder, "10 per cent are foreigners, 5 per cent Irish, and 4 per cent English." It is nice of the Board to distinguish the 4 per cent from the other foreigners.

★ ★ ★

According to the *Daily Mail* (Irish edition), "Years of planning and the expenditure of millions of pounds by the Government to bring electricity to the streets of dozens of small towns and villages in Eire is being negatived by a dispute over the provision of a switchman to do a few minutes' work each night." The Electricity Supply Board says that it is under no obligation to provide a switchman and the County Councils say that it is. It is not clear what this "switchman" is supposed to do. There is a reference in the report to the mere pressing of a button which seems to be simple enough unless it has to be pressed in a particular way, needing a trained touch.

★ ★ ★

Echoes of the Clow surcharge are still reverberating in the newspapers. For instance, the Manchester *Daily Dispatch* publishes a letter from a lady who says that she was "stung to the tune of seven pounds, three shillings" and found it a severe hardship to pay up. If the amount mentioned is all surcharge I calculate that her consumption for the one winter quarter concerned was about 4,900 kWh which is well above the average.

★ ★ ★

I have heard nothing of a serious explosion at the Cavendish Laboratory but how is one to account for the recent advertisement in the *Cambridge Daily News*? It reads: "Cyclotron thirty-two inch chrome pole pieces; spare electrodes. Write —, Cambridge." Bits and pieces of cyclotrons are not common articles of commerce for few people are so far engaged on constructing their own machines.

★ ★ ★

In his broadcast "American Letter" last Friday Alistair Cook, dealing with the vast number of specifications with which the American Patents Department has to cope, mentioned the patenting of the first audible signal. It is that of the National Broadcasting Co. of America, consisting of the three musical notes "G.E.C." To me it sounds more like a trade mark registration.

Meter Testing

Benefits of Standard Terminal Dimensions

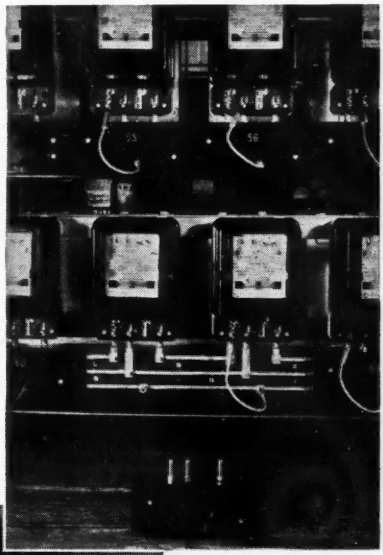
By JOHN T. VICTOR, B.Sc., A.M.I.E.E.*

SINCE vesting day a considerable number of the smaller electricity meter testing stations have been closed down, with the result that those now functioning have to handle larger numbers of meters. One factor which can materially assist in speeding up the testing of new meters is the now universal production by manufacturers of single-phase Wh meters having the agreed standard fixing centre and terminal dimensions. In order, however, to benefit from this, meter test benches must be specially designed for the purpose.

The test bench illustrated was modified from an old wooden bench. The battens which carried the meters were removed and replaced by two pairs of aluminium channels. The upper of each pair carries screws at 7 in centres. On the lower are mounted a series of Bakelite blocks in two halves, between which are clamped in suitably moulded recesses three pins, the outer two of which take the current to and from the meter and the middle pin is the neutral potential connection.

* Meter and Test Superintendent, Edinburgh Area, South East Scotland Electricity Board.

Neighbouring blocks interlock into each other and short lengths of heavy bare flexible copper conductor join the last current pin of one block to the first current pin of the next block.



A continuous cable is threaded through the square lower ends of the neutral potential pins forming the neutral bus-

Interchangeable connecting blocks, three-pin interlocking, for meter testing at Edinburgh, with close-up view of one block removed from busbars

bar. The live potential busbar runs in the lowest moulded slot. On to the bare cable are threaded brass blocks which are clamped by means of screws drilled to receive small plugs with short lengths of light single-core flexible cable for connecting to the meter shunt screws. The three pins are centred to the standard meter terminal block dimensions and are screwed into the square lower sections. They can, therefore, be interchanged so that meters having the present long range 10 or 25 A rating can be accommodated. To reduce volt-drop to the minimum, all the brass blocks were sweated to the flexible conductors. The photograph shows the blocks with two of the outer halves removed, revealing the busbars and pins. The blocks were manufactured by Smith Meters, Ltd., to my design.

The bench is double sided, 16 ft long and can accommodate 104 meters. The bench is used exclusively for testing new meters by method "A" (long period dial test) and up to 300 meters can readily be tested each week, thereby leaving the other benches free for the testing of overhauled meters.

COOLING GAS TURBINES

Higher Blade Temperatures Permissible

AVAILABLE materials limit the inlet temperature of a gas turbine to 1,250 deg F except when the machine is to operate for limited periods only at full output.

Thermal efficiency obtainable at the output shaft at this temperature is about 33 per cent in the case of a machine designed for high efficiency and long life. Only a relatively small improvement of efficiency would result from the use of a complex cycle at the same temperature. It would be more advantageous to raise the inlet temperature to 2,200 deg F, which would involve an operating blade surface temperature of 1,200 deg F if the working stresses are to remain reasonable. This can be done if the machine is cooled in one of three ways, as indicated by Dr. T. W. F. Brown (research director, "Pametrada") in a paper recently submitted to the Institution of Mechanical Engineers.

He considers the case of open cycle gas turbines designed for 100,000 hours' service life at full power, and shows how elevation of the working temperature would affect the design of the combustion chamber, the turbine, the heat exchangers, and the connecting pipes conveying the hot gases between these three portions.

His conclusions are that there is nothing inherent to prevent the use of a high inlet temperature, provided the turbine is cooled. The resulting thermal efficiency would make the effort worthwhile. For simplicity and smaller sets "sweat" cooling has much to recommend it; it would involve using hollow blades made of porous sintered material through which air could be forced from the centre of the blade outward through the pores, the cool air passing into the gas stream and mixing with it.

For the highest efficiency water cooling must be used, and it would be better to employ the steam produced in this way in a turbine to develop power rather than to pre-cool the air inlet, unless simplicity is the over-riding factor. The author's calculations show that water cooled blades can be at a surface temperature of 1,200 deg F without the cooling seriously reducing efficiency. Temperature gradients due to cooling will induce compressive stress on the gas side, which will, in turn, reduce the tendency to fatigue cracking. These gradients will be of a simple type so that any excessive stresses caused by heating and cooling will be obviated.

The feasibility of using high temperatures in gas turbines for ship propulsion (a marine layout is included in the paper) and in power stations where long life and reliability are essential will need to be proved on the test bed before it can be treated as a commercial proposition, but the author's calculations will be a useful means of assessing some of the controlling factors involved.

The Year's Progress

Further Details of Manufacturers' Work in 1949

THROUGHOUT 1949 all the works of **Crompton Parkinson, Ltd.,** were fully engaged. At Chelmsford the Machine Department had a record output of alternators up to 1,000 kVA 6.6 kV, auto-synchronous, induction and d.c. motors. A large number of alternators was supplied to manufacturers of generating sets for standby supply.

Auto-synchronous motors up to 1,500 h.p. have been despatched to many parts of the world. Dollar-earning orders included one for 46 motor-generator sets and nine alternators of a total value of £50,000 for South America.

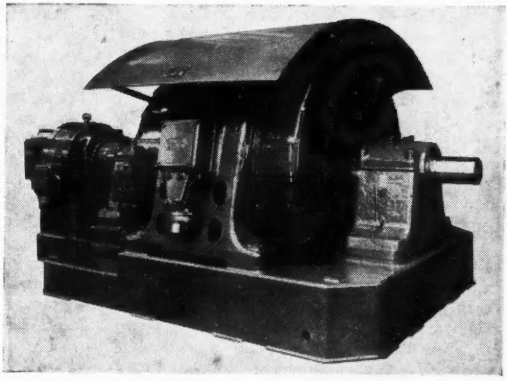
The Machine Department has also been busy manufacturing traction motors for the second of two orders received from the Cairo Tramways and for those in Warsaw and Instanbul. For the London Transport Executive new "R" type surface-stock motors, designed jointly by Crompton Parkinson, Ltd., and the General Electric Co., Ltd., are of the self-ventilated nose-suspended type of 110 h.p. at the one-hour rating, without armature core ducts, which tend to become blocked with dirt.

The Traction Division was responsible for the electrical equipment of the four seven-car trains put into service on the Southend Pier Railway during the year, and also concerned with the modernization of tramway equipment for the Blackpool Corporation; 18 new equipments were ordered and the first was put into service towards the end of 1949. The new tramcar is a single-deck type with four motors. It has resilient wheels and "Vambac" multi-notch control gear.

Trolley-bus equipment has been supplied to the Rotherham Corporation for installation in 18 new single-deck type vehicles which will be used for the fastest trolley-bus schedules in the country. Equipment was also supplied for the new double-deck trolley-buses inaugurated at Glasgow during the year.

A large proportion of the a.c. motors from the Guiseley works and the fractional h.p. "Minor" motors from the Doncaster works went to other manufacturers for machine drives. Some 3,500 motors of up to 10 h.p. for the Hydro-Electric Power Commission of Ontario are to be used in areas where frequency is being changed from 25 to 60 c/s. The order was obtained by Crompton Parkinson's Canadian agents, Bepco Canada, Ltd., Montreal. It is probably the largest single order for electric motors ever placed by Canada in either Great Britain or the United States.

The Switchgear Department at Chelmsford has made for overseas countries 11 kV. 250 MVA, oil circuit-breakers as complete single and duplicate busbar assemblies. A large number of oil breakers went to Canada for incorporation in switchboards to be completed in that country to meet particular require-



Auto-synchronous 1,400 h.p. 750 r.p.m. 3.3 kV motor, one of a large number supplied by Crompton Parkinson for industrial drives in overseas and home factories

ments. They are mostly of the 150 MVA class for 6.6 or 11 kV and the 25 MVA class for 3.3 kV. The latter is only 1ft 6in by 2ft by 1ft 8in, since the SL.100 self-aligning finger contact of high thermal performance is capable of dealing with short-circuit currents without special arcing contacts.

An improved form of the "T. A. P." fuse-operated circuit-breaker incorporates new types of fuses developed at Chelmsford and has been "proved" in the high-power test station operated by Crompton Parkinson, Ltd.; three models are now available with fault-power ratings of 100, 150 and 250 MVA respectively. A new spring-closing mechanism has powerful clock-type springs; the closing force required for different switchgear units can be obtained by varying the number of springs in an assembly.

There has been a demand for the well-known "Klad" range of switchgear; one single order was for 58 units for the Travancore Rayon Co.

In connection with the testing of switchgear in the high-power station at Chelmsford, the Development and Research Department has designed and constructed a "point-on-wave selector," which is an electronic device for initiating the short circuit at any point of the 50 c/s wave within 0.00017 sec; it provides for a more precise control of the testing conditions to ensure maximum severity.

The Contract Department at Chelmsford has been responsible for a number of complete electrification schemes. Of particular interest is a contract in connection with the two thermal stations forming part of the Owen Falls hydro-electric scheme, being carried out under the direction of Kennedy & Donkin, London, consulting engineers to the Uganda Electricity Board.

For one station "DA2A" 11 kV truck-type cubicles will be part of a complete switchboards which includes exciter electronic voltage regulators, field suppression cubicles and auxiliary equipment for the control of the alternators.

The switchgear in the second station will consist of thirty-one "DA2" 3.3 kV cubicles with auxiliary equipment. Transformers are being supplied by the British Electric Transformer Co., four of 1,200 kVA for stepping up to 11 kV and two of 5,000 kVA for stepping up to 11 kV and 33 kV. All the main and control cables are of Crompton manufacture. The company is also providing the lighting fittings and lamps for the station.

Another contract, for the complete electrification of a chemical factory at Newport, Monmouthshire, involves the supply and installation of 6.6 kV switchgear, cables, several hundred motors, and a complete lighting installation.

The Lighting Engineering Department has been responsible for shop-window and display lighting by fluorescent lamps with newly developed forms of fittings.

Transformer Orders

The variety of units supplied last year by the **British Electric Transformer Co., Ltd.,** ranged up to 45 MVA in capacity. The last twenty of a batch of forty-five transformers for a public supply company in South Africa were completed.

Other overseas orders completed included thirteen 750 kVA, 11,500/460 V units for Cairo, and large numbers of distribution transformers for Tasmania, Egypt, Burma and European countries.

The largest of a wide range supplied for B.E.A. requirements was of 45 MVA, 132/33 kV, for Great Yarmouth. For control of reinforcing feeders in the area of the North Western Board two 20 MVA quadrature booster equipments were made for operation at 66/33 kV; all were fitted with type LS on-load control.

Twelve transformers for the Midlands Board and a booster regulator with a throughput of 12 MVA for the Birchills substation were fitted with B.E.T. type MDA on-load tap-changing gear with mercury-switch sparking contacts to relieve the main contacts of the duty of making and breaking current.

Apart from work actually completed there was considerable activity in the construction of units forming parts of orders that will be despatched during 1950, including a batch of ninety-six for the South Western Board. For the non-standard distribution system at Hampstead eight 1,500 k/VA, 6.6/2 kV 3/2-phase Scott-connected banks were produced.

Transformers were made for industrial electrification both at home and overseas. Three 2,500 kVA voltage regulators were supplied to India and another 5,000 kVA unit to New Zealand.

RECENT INTRODUCTIONS

NOTES ON NEW ELECTRICAL AND ALLIED PROJECTS

Hedge Trimmer

THE improved "Boffin" electric hedge trimmer made by RAYLOR BROTHERS, LTD., 81, Piccadilly, London, W.1, is fitted with a more powerful motor of B.T.H. construction. The cutting blade has been redesigned and the feeder plate has been modified to enable the edges of the lawn as well as the hedges to be trimmed. A portable generator is obtainable for use where no mains supply is available.

Lighting Fittings

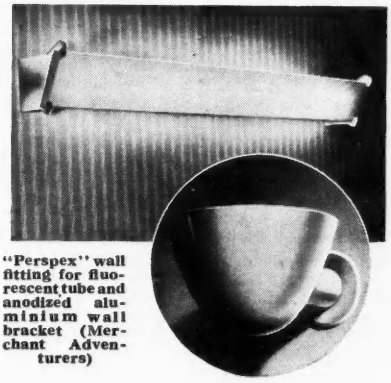
A comprehensive new range of lighting fittings brought out by MERCHANT ADVENTURERS, LTD., 43, Portland Road, London, W.11, covers ceiling and pendant fittings, wall brackets, and table and floor standards. One particularly attractive floor standard with table lamp to match is designed to give semi-indirect lighting. It has a glass bowl mounted on the wooden stem with an aluminium or fabric shade. A novel form of fixing with no screws visible has been adopted for a neat wall bracket of anodized aluminium available in various sizes. A flush recessed ceiling fitting incorporating a 10in prismatic lens can be had in either bronze or anodized aluminium finish. Various types of glass and "Perspex" units to accommodate fluorescent tubes include wall brackets.

Lamp Adaptor

It is announced that an adaptor enabling 5ft fluorescent tubes with bayonet cap connections to be used in standard bi-pin holders is now available from ANOWARE, LTD., Metalux Works, King's Cross Road, London, W.C.1. These "Bay-pin" adaptors will permit the use of 5ft tubes with remote control gear without resorting to unsightly spring clips and bent pieces of metal to conceal the bayonet lampholders normally employed.

Surface Socket Outlet

In addition to the "Nettle" flush-mounting 13A shuttered socket outlet, VICTOR H. IDDON, LTD., Harper Road, Wythenshawe, Manchester, are now producing a surface type socket of similar design. Its main feature is the porcelain interior

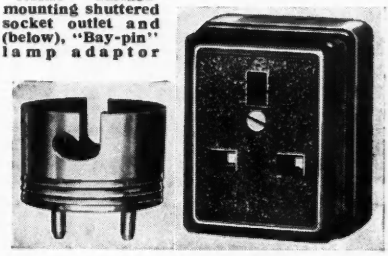


"Perspex" wall fitting for fluorescent tube and anodized aluminium wall bracket (Merchant Adventurers)

which minimizes the possibility of tracking and it also incorporates a recently designed contact and terminal for taking up to three 7/.029 cables. The moulded body is complete with knockouts for surface wiring.

Coating Thickness Meter

An instrument designed to measure the thickness of all non-magnetic protective and decorative coatings on ferrous bases is now available from the EAST LANCASHIRE CHEMICAL CO., LTD., Fairfield, Manchester. This "Elcometer" gives instantaneous indication with an accuracy of ±5 per cent (±0.0001in) and is independent of outside power sources. Its operation depends essentially on a permanent magnet, the flux across an air gap in which is varied by the proximity of a ferrous surface to the two



"Nettle" surface-mounting shuttered socket outlet and (below), "Bay-pin" lamp adaptor

contact spheres on the base of the meter. Weighing less than 6oz, the instrument is housed in a die-cast aluminium case finished in black crackle enamel and is supplied together with a leather case incorporating an inner pocket to take foil strips for checking purposes.

Improved Lawn Mower

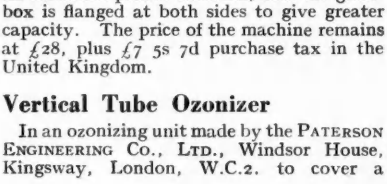
In an improved model of the lawn mower made by H. C. WEBB & CO., LTD., Tame Road, Witton, Birmingham, 6, the motor and switchgear are totally enclosed, the handles and switch lever are covered with an insulated plastic material, and the grass-box is flanged at both sides to give greater capacity. The price of the machine remains at £28, plus £7 5s 7d purchase tax in the United Kingdom.

Vertical Tube Ozonizer

In an ozonizing unit made by the PATERSON ENGINEERING CO., LTD., Windsor House, Kingsway, London, W.C.2. to cover a variety of requirements in the field of water treatment the electrodes are mounted vertically and so arranged that they are cooled by the incoming air. These electrodes are of tubular stainless steel and are usually limited to eighteen for convenience of unit size.

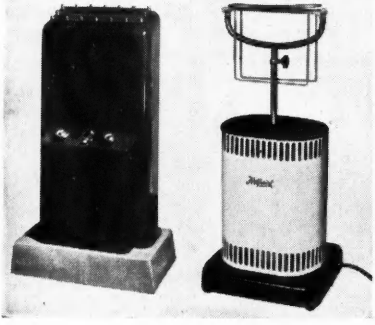
A glass dielectric tube is supported concentrically by adjustable pins at the top of the electrode, where a cone is incorporated for making the adjustments required to ensure a uniform annular gap between the dielectric and the electrode. The air which passes through this gap is ionized and ozone is generated. The ionized air enters the electrode tube at its mid-point and is discharged into a common outlet under the heater plate, whence it is entrained with the water to be treated.

The unit is operated from a.c. mains through a transformer, usually incorporated in the base of the ozonizer casing, a tapped winding providing a means of regulating the voltage and consequently the ozone output. A feature of the unit is that the dielectric is allowed freedom to expand; it does not carry the weight of any other part, nor is it restricted by glands. Both the electrode and the dielectric tube are quickly removable for cleaning without disturbing the h.v. connections.



Improved model of electric lawn mower

Paterson vertical tube ozonizer and (right) the redesigned Hotpoint clothes dryer



Clothes Dryer

The HOTPOINT ELECTRIC APPLIANCE CO., LTD., of Crown House, Aldwych, London, W.C.2, has redesigned its portable electric clothes dryer. The new unit, which is finished in cream enamel, has a black stove enamel steel base with black enamelled top cover plate. It has a single central tube assembly supporting the heavy gauge plated and polished folding arms. A fabric enclosing cover and 9ft of 3-core rubber insulated cable are supplied with each dryer. Half of the loading of 1,500 W is controlled by a tumbler switch located in the base. The dryer is suitable for either a.c. or d.c. and the retail price is £7 10s, plus (United Kingdom only) £1 19s purchase tax.

Insulating Tape for High Temperatures

By the controlled processing of polytetrafluoroethylene (P.T.F.E.), a polymer containing carbon and fluorine atoms only, CRANE PRODUCTS, LTD., Slough, have produced the "C.F.2" tape which is claimed to be a remarkably efficient insulant at high ambient temperatures. In addition to being thermally stable the material has a low power factor (0.0002 over a wide range of frequencies), it does not track when arcing occurs and is not wetted by condensation.

The tape is particularly suitable for use on high frequency cables and similar equipment when exposed to high temperatures. It is supplied in three grades—standard, tensilated and super-tensilated.

Apart from insulating tape, the company is also supplying "C.F. 2" gland packagings for use with chemicals and acids of a highly solvent or corrosive nature. These are chemically inert, non-toxic and have good mechanical properties and low coefficient of friction.

Redesigned Kettle

A new model of the 3-pint "Pylon" electric kettle made by PREMIER ELECTRIC HEATERS, LTD., Keeley Street, Birmingham, 9, is "streamlined" in keeping with the present-day trend. The construction is particularly robust, being of heavy gauge copper, finished in chromium plate. The kettle is fitted with the "Premier" fully automatic safety device which, incidentally, when tested was left on circuit for over 5,000 continuous hours during which it operated over 100,000 times.

The 1,500 W model is being sold for 62s., 1s. less than its predecessor. A 3-pint 1,000 W model costs 60s.

Food Mixer

A food mixer brought out by the ENGLISH ELECTRIC CO., LTD., East Lancashire Rd., Liverpool, 10, is powered by a 1/8 h.p. fan cooled motor, running at 14,000 r.p.m. (full speed) and consuming 140 W. It will operate at 200/250 V either on d.c. or on a.c. up to 60 cycles. Speed control is provided on the driving shaft between 275 and 900 r.p.m. No lubrication is required, the bearings and gear box being packed with a sealed-in supply of grease.

The motor is housed in a die-cast aluminium case finished with cream stoved enamel with a black moulded plastic handle. The base is similarly constructed and finished. The beaters are of chromium plated steel, and above the motor the juice extractor—consisting of a bowl, strainer, reamer and a spout—can readily be fixed. Two bowls ($3\frac{3}{4}$ pints and $1\frac{1}{2}$ pints) are provided, of cream opal glass ribbed for easy handling. A turntable on which the bowls may rest is of steel with cream stoved enamel finish. The weight of the unit is $5\frac{1}{2}$lb and the stand and bowls together weigh $7\frac{3}{4}$lb, making a total of $13\frac{1}{4}$lb. The retail price is 15 gns, plus £3 18s 9d purchase tax (United Kingdom only).

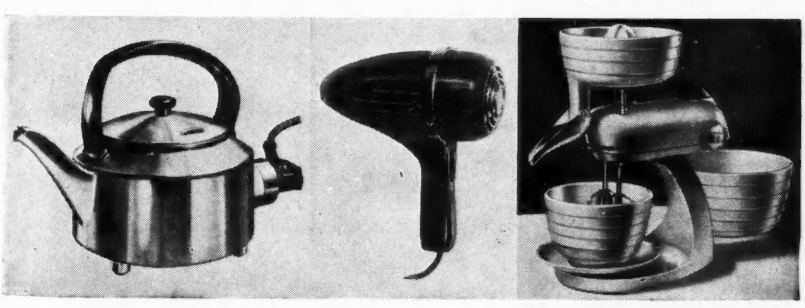
Hairdryer

An addition to their "Duco" range of appliances, the "Boudoir" hairdryer, is announced by BROWN BROTHERS, LTD., Great Eastern Street, London, E.C.2. This compact streamlined unit dryer has a shockproof bakelite casing with an attractive walnut finish. It is well balanced and an easily accessible 3-position switch gives either a hot or a cold air stream. A universal motor is incorporated and the loading is 550 W when delivering hot air and 50 W cold. Six feet of flexible lead and a mains plug are provided. The retail price is £2 17s, plus 14s 3d purchase tax in the United Kingdom.

Measuring Radio Interference

It is announced that the British Electrical and Allied Industries Research Association has designed for the Admiralty a portable instrument for the measurement of radio interference in ships. It is, however, equally suitable for land purposes. Measuring sets constructed to the Admiralty specification are now being manufactured by Electric and Musical Industries, Ltd., Hayes, Middlesex, and the Lords Commissioners of the Admiralty have stated that they have no objection to civilian organizations using

Redesigned Premier "Pylon" 3-pint kettle; "Boudoir" hairdryer; and English Electric mixer



the design, no charge being made to cover the cost of development. Interested authorities who wish to view the set should approach the E.R.A. or E.M.I., Ltd.

Laboratory Valve Voltmeter

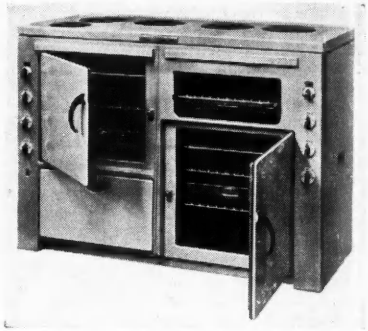
A mains operated valve voltmeter, which has been designed especially for laboratory use, is now in production at the works of ELECTRONIC INSTRUMENTS, LTD., 17, Paradise Road, Richmond, Surrey. It measures both d.c. and a.c. voltages from 0.2 to 250V, with an upper frequency limit of 200 Mc/s, and resistance from a few hundred ohms up to 500MΩ in four decades. It is also capable of indicating variations in power level over a wide range of decibels.

Public Address Equipment

A portable amplifier weighing only 14 lb and having an audio output of 3 W has just been placed on the market by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2. The equipment is suitable for use in vehicles for public address purposes, and care has been taken to keep the power consumption of the amplifier very low, so that it will give good service from a 6 V battery that is not being constantly charged. Two horn-type loudspeakers can be operated from the unit and for simplicity of operation only two controls are provided: an on-off switch and a volume control.

Restaurant Range

The H.C. 2899, a new model of the "Creda" restaurant range made by the SIMPLEX ELECTRIC CO., LTD., Broadwell, Oldbury, is a more convenient height (6in lower) and has a warming drawer with a 400 W element incorporated in the bottom.



"Creda" restaurant range for 6-60 persons

With both large and small ovens, five hotplates and a separate grill, it can be used economically for as few as six or as many as sixty persons. The total loading is 19.1 kW. In two-tone ivory finish the price is £99, in silver grey mottled it is £96.

Workshop Handlamp

An inspection handlamp which is offered by ROWLANDS ELECTRICAL ACCESSORIES, LTD., R.E.A.L. Works, Hockley, Birmingham, 18, has a handle of oil-resistant rubber and carries a rubber-moulded cord grip. The porcelain lamp holder rests in a shaped recess in the moulding of the handle while the wire guard is mounted on a threaded retaining ring which is screwed on to the handle. There are no screws or other fitments to come loose and the assembly provides an anti-vibration mounting for the lamp, which is claimed to be completely shockproof.

(A) Laboratory valve voltmeter Model 26. (B) G.E.C. mobile amplifier (C) R.E.A.L. handlamp

E.R.A. Annual Meeting

Council Elections and Luncheon Speeches

At the twenty-ninth annual general meeting in London last week of the British Electrical and Allied Industries Research Association, a business formality which followed a finance meeting, the annual report (which was summarized last week) and audited accounts with balance sheet for the year ended September, 1949, were adopted without comment.

Lord Citrine (B.E.A.) is the new president in place of Sir Vincent Z. de Ferranti, while Mr. H. Astbury (Crompton Parkinson, Ltd.) is the new chairman of Council in place of Mr. R. Lee, who has been in office for two consecutive two-year periods.

New members of Council are Messrs. W. N. C. Clinch, T. E. Goldup and W. S. Sawtell in place of Messrs. F. W. Lawton, H. L. Kirke and J. S. Pickles (retired), while the following (due to retire by rotation) were re-elected: Sir John Dalton and Messrs. J. K. Brown, A. Collins, J. Eccles and C. W. Marshall.

Key to Industry

Prof. Sir Lawrence Bragg (Cambridge) was the principal guest at the subsequent luncheon, which attracted many more than last year. He proposed the toast of "The E.R.A.," which he described as the key to an industry which was itself founded on pure research; in that respect it was unique. Recognition of research was not enough; one must be consciously sympathetic to what it was and what it could do. Those who set out to find new ideas must forget what they might be applied to. The electrical industry was founded on what had been described as "entirely useless knowledge," but if Faraday had been planned or co-ordinated there would be no electrical industry to-day. The pursuit of knowledge must be done in different ways and by different people from those who would have to apply its results.

British research associations had no parallels in other countries, where the experiment was being watched very keenly. Their strength was in their ability to ask themselves whether they were right and how they could better their work, because there were many false starts in research. He would like to see in the Association, which applied itself to practical things and concrete purposes, a section wherein "free lance" work could be done as they did in the universities. Facilities to take "long shots in the dark," which sometimes came off, would attract and tend to keep the best type of recruit to do good work.

Lord Citrine, in responding, remarked that events had demonstrated the B.E.A.'s policy of co-operation and readiness to shoulder its full share of the financial burden. Research was an active faith based on encouraging experience, but there must be conscious direction of long-term research. The immediate concern of the B.E.A. was to improve the efficiency of generation, to conserve manpower and reduce the capital costs involved in the building of power stations, whereas the E.R.A. had a much wider range. The need was for organization and direction, adequate accommodation and finance, still a good deal on the modest side. The £1,000,000 Leatherhead project had been reduced to £600,000; that sum might be too large for the present, but his hope was that a decision might be made during his year of presidency in order to avoid stagnation.

Mr. R. Lee proposed the toast of "Our President," to which Lord Citrine replied.

A meeting of the Council followed immediately after luncheon.

Illuminated Beacons

Experiments in the lighting of Belisha beacons are being carried out in London by the Road Research Laboratory of the Department of Scientific and Industrial Research. The beacons are fitted with 40 W lamps.

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE triennial award of the Coopers Hill War Memorial Prize and Medal, which fell in 1949 to the Institution of Electrical Engineers, has been made by the Council to **Mr. E. D. Taylor,** M.Sc., for his paper on "The Measurement of Interlamination Resistance on Varnish Insulated Sheet Steel for Large Electrical Machines."

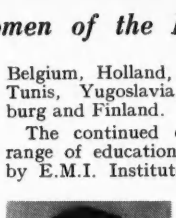
Mr. O. F. Mingay, editor of the *Australian Radio Electrical Weekly,* who has been in this country for some time, has decided to extend his stay until 29th April. He will then visit Canada and the United States before returning to Sydney by 22nd July. He will then have covered 40,000 miles in his thirteen months' business tour. Mr. Mingay's address is 10, Salisbury Avenue, Cheam, Surrey (Vigilant 3608).

Mr. H. R. Farries, manager of the Swindon District of the Southern Electricity Board, announced at a recent dinner that he was shortly taking up the post of manager of the Aldershot District.

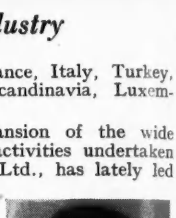
Mr. F. Harris, A.R.P.S., publicity manager to the Carborundum Co., Ltd., and producer of the company's series of instructional colour-films, is taking up a similar appointment with Smart & Brown (Engrs.), Ltd., Spennymoor, Co. Durham.

Forty-six delegates from twenty countries attended the **International Broadcasting Conference** held at Torquay last week. They discussed plans for the formation of a new European Broadcasting Union open to all in the European Zone. As well as B.B.C. officials there were delegates from Belgium, Holland, France, Italy, Turkey, Tunis, Yugoslavia, Scandinavia, Luxemburg and Finland.

The continued expansion of the wide range of educational activities undertaken by E.M.I. Institutes, Ltd., has lately led to the acquiring and equipping of new premises at 10, Pembridge Square, London, W.2, and two new staff appointments have been made. **Mr. J. B. McMillan,** M.A., B.Sc., has been appointed director of college studies, and **Mr. P. T. V. Page,** B.Sc., A.M.I.E.E., director of postal studies.



Mr. J. B. McMillan



Mr. P. T. V. Page

Mr. McMillan has been with E.M.I. Institutes since January, 1947, first as lecturer and then senior instructor. Previously he served with the R.A.F. Education Branch where he specialized in radio and radar teaching. Mr. Page's early service was with Metropolitan-Vickers and the Westinghouse Brake & Signal Co., after

B.B.C. Delegates at the Torquay Conference. Left to right:— Sir Noel Ashbridge (Director of Technical Service); Mr. F. C. McLean (Engineering Service); Sir Ian Jacob (Director, Overseas Service); Mr. H. Bishop, chief engineer; and Mr. R. D. Marriott, European liaison officer

which he went to the Military College of Science, Bury, as lecturer in electrical engineering. Subsequently he became Officer Commanding, Heavy Anti-Aircraft Workshop, R.E.M.E. (Canadian First Army), and later technical staff officer on the German Control Commission. Before joining E.M.I. Institutes he was head of the Telecommunications Department of Dartmouth Technical College.

Mr. W. E. W. Petter has resigned as chief engineer, aircraft division, of the English Electric Co., Ltd., and has been succeeded by **Mr. F. W. Page,** who was assistant chief designer. **Mr. D. L. Ellis** has been appointed deputy chief engineer.

Mr. J. F. Colquhoun, who has been lighting engineer to the Sheffield Corporation for the past twenty-five years has retired, and has been presented with a gold watch by the chief officials of the Corporation.

Mr. J. H. Cresswell, supplies director of the Revo Electric Co., Ltd., has been elected president of the Warwickshire and Worcestershire Counties Bowling Association.

Mr. V. A. Lowinger, C.B.E., retired from the chairmanship of the International Tin Research & Development Council, which controls the Tin Research Institute, on 31st December last as he is no longer permanently resident in England. His successor is **Mr. G. F. A. Burgess,** a joint managing director of the British Metal Corporation, Ltd.

Mr. J. C. Laing has been appointed by the St. Helens Cable & Rubber Co., Ltd., of Slough, Bucks, as area manager and engineer for Derbyshire, Leicestershire, Lincolnshire, Nottinghamshire and Northamptonshire. Mr. Laing served his apprenticeship with Newton Bros (Derby), Ltd., and subsequently joined Derby Colliery (Drury-Lowe), Ltd., Derby, where he became chief engineer. After eighteen years with that company he was appointed technical representative in the Midlands for Hardypick, Ltd., Sheffield. He is a past branch president of the Association of Mining Electrical and Mechanical Engineers, and is an associate member of the Institute of Mining Engineers.

The retirement is announced of **Mr. H. C. Runnals,** manager of the Swansea branch of the General Electric Co., Ltd., for the past twenty-nine years. Mr. Runnals joined the G.E.C. at Cardiff in 1904 and subsequently held various positions there, including managership of the Lamp Department. In 1913 he became chief assistant at the G.E.C. Swansea branch. He left Swansea in 1915 to represent the company in the Gloucester, Devon and Cornwall areas, returning in 1921 as manager. On his retirement his successor, **Mr. H. G. Morgan,** presented him with a cheque subscribed to by his colleages at the Swansea branch. Mr. Runnals also received cheques from the directors of the company and colleagues in the Cardiff, Gloucester and Bristol branches. These were presented to him by Mr. H. B. Ducé, manager of the G.E.C. Cardiff branch at a luncheon given in his honour at Cardiff.

Mr. W. Hall, B.Sc.Tech., has been appointed sales manager, Motor Department, of the Metropolitan-Vickers Electrical Co., Ltd., as from 1st February. He received his technical education and took his degree at Manchester College of Technology. On completion of a college apprenticeship with the company (1922-24) he became a sales engineer in the Motor Sales Department, and was appointed assistant to the sales manager in February, 1947.

Mr. W. Hall

Mr. J. D. Peattie, deputy chief engineer (generation), British Electricity Authority, and **Mr. A. A. Fulton,** chief hydraulic and civil engineer, North of Scotland Hydro-Electric Board, are among the members of the reconstituted Inland Water Survey Committee.

The annual dinner of the works supervisory staff of the **Benjamin Electric, Ltd.,** was held at Tottenham on 6th February. There were present thirty-three members of the staff whose length of service averaged twenty-one years. Mr. Guy Campbell presided, and others who attended were Mr. L. R. Kavanagh (works director), Mr. H. L. Smith (commercial director), and Mr. H. G. Campbell (assistant managing director).

The annual presentation concert of the Telcon Social & Athletic Club was held on 1st February in the works canteen. After the concert by the Telcon Concert Party the Mayoress of Greenwich, Mrs. George Bruce, presented the cups and trophies for indoor and outdoor games. Mr. J. N. Dean, managing director of the **Telegraph Construction & Maintenance Co., Ltd.,** then presented long service certificates to thirty members of the staff, and awards in the form of cheques to students who had been successful in examinations. Dancing followed. Others present included Mr. F. Leighton, president of the Club and works

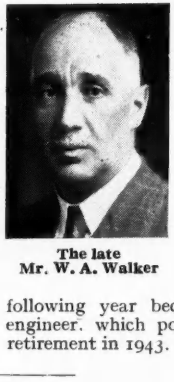
manager, Messrs. B. H. Musgrave and W. F. Randall (directors) and Dr. E. W. Smith (director of Submarine Cables, Ltd.).

OBITUARY

Mr. Lawson A. Darby, manager of the London depot of Exide and Drydex, died at the end of January at the age of sixty-three. Mr. Darby joined the Chloride Electrical Storage Co. thirty-seven years ago, and had been manager of the London depot for the past thirty years.

Mr. W. J. Cusack.—The death occurred on 6th February, in his 79th year, of Mr. William James Cusack who retired from the British Thomson-Houston Co., Ltd., in 1944 after forty years' service. Mr. Cusack received his technical training at the works of Davy, Paxman & Co., Colchester, where, subsequently, he became chief of the Commercial Department. In 1903 he joined the British Thomson-Houston Co., Rugby, and in 1907 was appointed manager of the B.T.H. Manchester district office. In 1917 he returned to Rugby as manager of all district offices. Owing to the growth of B.T.H. business a reorganization took place in 1932, but from that date until his retirement he was engaged on matters of all kinds relating to the district offices.

Mr. W. A. Walker.—The death occurred on 3rd February at the age of seventy of Mr. William Alan Walker, A.M.I.E.E., former borough electrical engineer at Kettering. Mr. Walker served his apprenticeship with Thomas Parker, Ltd., Wolverhampton, and later became chief assistant in the Aldershot Electricity Department. He joined the Kettering electricity undertaking in 1904 as chief assistant and in the following year became borough electrical engineer. which position he held until his retirement in 1943.



The late Mr. W. A. Walker

E.I.B.A. ACTIVITIES

THE pantomime *Babes in the Wood* was presented by the Elexcel Players (Elexcel, Ltd.) on 4th February at Broadgreen Hall, Liverpool, in aid of the Electrical Industries Benevolent Association, and resulted in £80 being contributed to the funds. The show was written and produced by Mr. Phil Heyes, of Elexcel, Ltd.

The Surrey Electricity Sports and Social Association is holding a variety concert at Cheam Baths Hall, Malden Road, Cheam, on 13th March, in aid of the E.I.B.A. A number of well-known concert artistes will appear, and tickets (10s, 6s, 4s, 3s and 2s 6d) can be obtained from "Fairways" Travel and Ticket Agency, 29, Station Way, Cheam (telephone: Vigilant 0012).

The North-West Lancs Branch of the E.I.B.A. is holding its first annual dinner-dance on 1st March at Squires Gate Holiday Camp Ballroom, Blackpool. Tickets (12s 6d each) can be obtained from Mr. C. H. Jones (hon. branch secretary), General Electric Co., Ltd., 214, Church Street, Blackpool.

The Nottingham Branch dinner-dance of the Association will be held on 25th February at the Victoria Station Hotel, Nottingham. Particulars can be obtained from Mr. C. J. Boreham (hon. branch secretary), East Midlands Electricity Board, Mapperley Hall, Lucknow Avenue, Nottingham.

A Ball in aid of the Association's funds was held at Derby on 3rd February, when the accompanying photograph was taken.

At the E.I.B.A. Derby Ball. Left to right: Messrs. L. C. Sharp (Chairman of Court); C. R. King (chairman, East Midlands Electricity Board); F. H. Pooles (chairman, Derby Branch); G. E. Power (hon. secretary); and H. S. Fothergill (secretary, E.I.B.A.)

Oil Jetty Lighting

New Installation at Hamble

TO cope with the increasing tanker traffic, a new floodlighting system has been installed by Shell-Mex and B.P., Ltd., on their Hamble (Hants) Installation Jetty No. 2. It is believed that the intensity and distribution of the lighting surpasses any other form of lighting used in connection with oil jetties.

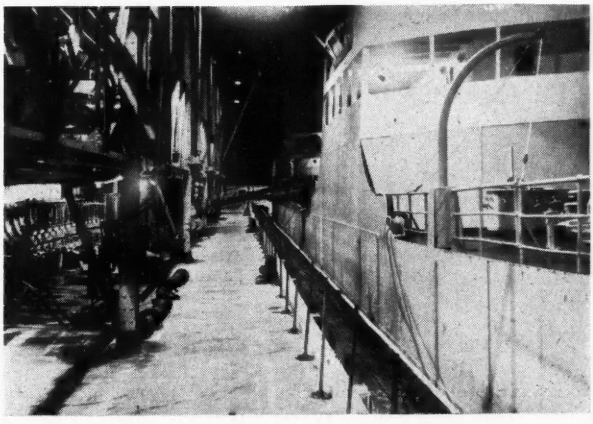
Many operations are performed on and around the jetty during the hours of darkness. Block floodlighting has, therefore, been applied to cover the entire deck of the jetty and to extend about 30ft or 40ft beyond the edges. In this way the small bunkering craft, which rise and fall with the tides, are illuminated. The equipment has been designed to avoid a serious cut-off of light over the sides of the jetty, particularly at the points where men leave the ladders or staging to transfer to the craft. Direct lighting could not be applied to these points, but reflected light has proved adequate. Eleven 500 W G.E.C. "ZF 16531" certified flameproof lighting units are mounted 28ft above the jetty, 40ft apart. Raising and lowering equipment (London Electric Firm) is provided for maintenance.

The "ZF 16531" unit was designed for use in mines and weighed 95 lb, but the weight has been reduced by half by manufacturing the units in alloy. The fittings, moreover, gave a narrow-angle beam and could not be depressed to an angle of less than 45 deg to the vertical. Treatment of the reflectors with a special paint increased the width of the beam and distributed the light evenly when the fitting was mounted vertically. Photometry readings showed an average intensity of 1.9 ft-candles on both sides of the jetty and 2.0 ft-candles immediately beneath each lantern.

The intensity of the lighting on the approach to the jetty is arranged to avoid serious reaction on the operating staff on arriving or leaving when the floodlighting system is in full operation. The fittings in that part of the installation were supplied by the Revo Electric Co. and the flameproof prismatic fittings by Walsall Conduits, Ltd.

The electrical installation is served by two p.i. armoured cables operating in parallel. These are designed to carry the combined lighting and heating requirements for Jetties Nos. 1 and 2, plus 20 per cent additional loading for future developments.

The dolphin or navigation lights are served by a separate cable interconnected with a standby generator, which is brought into operation immediately there is an interruption in the public electricity supply. The lighting standards on Jetty No. 2, of unusual design, were made by the Hamble installation staff. The electrical construction was undertaken by Troup Curtis and Co., Ltd., in co-operation with the G.E.C.



Floodlighting of the Shell-Mex oil jetty at Hamble, Hants

A.S.E.E. Diploma Scheme

THE examinations for the Swann Diploma of the Association of Supervising Electrical Engineers will be held at various centres on 24th and 25th May next. Application forms can be obtained from the general secretary, A.S.E.E., 54, Station Road, New Barnet, Herts, to whom the completed form should be returned not later than 1st March.

I.E.E. Section Dinner

THE annual dinner of the Measurements Section of the Institution of Electrical Engineers took place last week at the Café Royal, London. Prof. J. Greig (chairman) presided and proposed the toast of "Our Guests" to which Mr. H. Bishop (vice-president) responded in the absence of the president at the Scottish Centre dinner.

Sir Vincent Z. de Ferranti (past-president) was the principal speaker and remarked upon the very diverse interests of the Section, which reached down to the mundane operation of collecting money, but the collection of £200 million yearly was of some moment to the B.E.A. The whole science was based upon the accuracy of measurement; at the same time they must try to see that the task of collecting this "tax" on consumers was carried out fairly. There was a certain lack of appreciation of and loose thinking about the subject. A great deal of money was "wasted" by insistence upon extreme accuracy in metering. The makers did not mind, but it prevented anyone taking a real interest in doing metering in a reasonably economical manner, which would be one way of reducing the cost of the kWh to users.

Dr. G. A. V. Sowter (vice-chairman) proposed the health of the chairman and, in responding, Prof. Greig found it difficult to explain why the Section had not more than about 2,000 members. Notwithstanding its numerically small size it was catholic in its selection of papers, which ranged from application to recondite fundamental concept; but they seemed (a feature of the times) to push on from one subject to another without pausing to consider how far they had already gone. He wondered whether they were not taking their activities too seriously.

Engineering in Ipswich

TO celebrate its jubilee, the Ipswich Engineering Society (founded in 1899) has produced a handsome "History of Engineering in Ipswich." The first chapter of this 135-page book deals with the origin of the Society, and some well-known names appear. The first president was Mr. Leonard Turner, and the vice-presidents were Mr. (later Sir) William Reavell and Mr. H. S. Jefferies. Members of Council were Messrs. A. A. Arnold, E. Bruce Ball, E. Denton, W. S. Everard, A. A. Maxwell, H. V. Pegg and C. C. Trew. At the beginning of the century there were about 100 members and associates; the total is now nearly 700.

After a brief historical survey of Ipswich, with special reference to the growth of the engineering industry there attention is given to the port, the sewerage system, transport and other civic services, including the gas supply, but, unfortunately not the electricity undertaking.

The rest of the volume (about 80 pages) is devoted to the large engineering concerns which are natives of the town. The origin (1789) and progress of Ransomes, Sims and Jefferies, Ltd., has pride of place, and there are some intriguing pictures of the firm's early products. Next come E. R. and F. Turner, Ltd. (founded 1837), and the associated concern, Bull Motors, which celebrated its jubilee a year or two ago. There follow chapters on Fisons, Ltd. (chemical fertilizer manufacturers), Cocksedge and Co., Ltd. (structural and mechanical engineers), and Ransomes and Rapier, Ltd.

Next the business of Reavell and Co., Ltd. (compressor manufacturers) is dealt with at some length, the remaining chapters covering the Manganese Bronze and Brass Co., Ltd., Crane, Ltd., the Suffolk Iron Foundry (1920), Ltd., Egerton (Ipswich), Ltd., and the British Steel Piling Co., Ltd.

Throughout, the book is embellished with good illustrations, many of historical interest, and a 1778 map of Ipswich is used as end papers.

Ships' Auxiliaries

A COMPARATIVE examination of the characteristics of a.c. and d.c. drives for ships' electrical auxiliaries is made in a paper by Mr. R. Clarke recently submitted to the Institute of Marine Engineers.

The author approaches the subject from the performance point of view rather than from that of a.c. *versus* d.c., because the average ship's engineer is much more concerned with practical aspects than with pure design. It has been said that the use of a.c. motors and control gear for ship work will make a greater stock-pile available, thus implying that any stock industrial-type motor or starter of suitable rating can be used on board ship. This is a dangerous fallacy which in the long run, as the author points out, is likely to decrease the reliability of ships' electrical installations.

He maintains that electrical machinery should be specially designed for marine use and explains the reasons why; then, by descriptive comparisons of available types, he shows that it is possible to provide a.c. machines with approximately the same characteristics as those of d.c. types, the main object being to stress the recommendation that only electrical machinery designed for marine duties should be used on board ship.

Commerce and Industry

Sales in Dollar Markets

Generating Plant for Johannesburg

AN Anglo-American conference on "Sales Planning for Dollar Markets" will be held in London on 13th-14th March. Organized jointly by the Incorporated Sales Managers' Association and its American counterpart, National Sales Executives, the purpose of the conference is to give British industrialists an opportunity to put questions on American markets and marketing facilities to American sales executives and British sales managers who have experience of American markets. A party of twelve is coming over from the United States, including Mr. R. A. Whitney, president, National Sales Executives, Mr. Arthur H. Motley, chairman of the N.S.E. Board, and Mr. Don Mitchell, president, Sylvania Electric Products, Inc.

Rubber in 1949

Statistics received from the Secretariat of the Rubber Study Group show that the production of natural rubber in 1949 was 1,482,500 long tons and the consumption 1,427,500 tons (including estimated imports into Russia of 105,000 tons). Stocks at the end of the period are given as 757,500 tons, representing a reduction of 12,500 tons during the year. Figures for synthetic rubber were: Production, 440,332 tons; consumption, 447,500 tons; end-of-period stocks 110,000 tons, a reduction of 15,000 tons.

Unusual Recovery Claim

At the Brentwood County Court recently Lloyds Bank, Ltd., sought to recover £100 paid by them in respect of a cheque drawn by H. W. Field & Son, Ltd., Harold Wood, Essex. From the evidence it appeared that Field & Son made the cheque payable to Mr. Rutter Harbott, a director of Rutter Harbott Bros. and the Tower Engineering Co., for goods which were to be delivered by a certain date. When the goods did not arrive Mr. E. G. Green, one of the directors of Field & Son, instructed his bank not to meet the cheque. In the meantime Mr. Rutter Harbott had drawn £100 from his branch of Lloyds Bank in respect of the cheque.

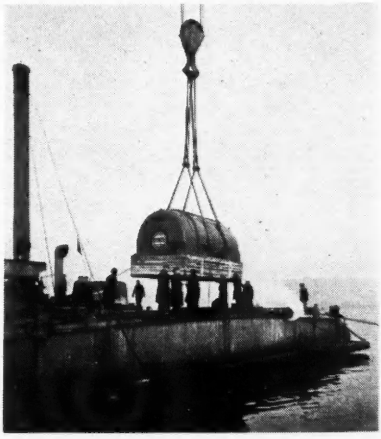
In giving judgment for the plaintiffs for the full amount claimed, Judge Andrews said that this was an unusual case in which a bank was proceeding against the drawer of a dishonoured cheque instead of the person who presented and cashed it. This it was legally entitled to do.

New B.I.C.C.-Ferranti Meter

British Insulated Callender's Cables, Ltd., and Ferranti, Ltd., announce the introduction of a new single-phase watt-hour meter, type FM, which is the result of joint research and development between the two companies. The meter is in production, and further information concerning details and performance of the new meter will be available shortly.

Plant for South Africa

The fourth 47,000 kVA, 3,000 r.p.m. turbo-alternator manufactured by the General Electric Co., Ltd., for installation in the Orlando power station, Johannesburg, was recently loaded on board the S.S. *Geologist*, of the Harrison Line, at Birkenhead for shipment to Durban. The stator, which weighs 82 tons, was transported from the quay and loaded on board the vessel by a 200-ton floating crane of the Mersey Docks and Harbour Board. The accom-



G.E.C. 47,000 kVA alternator being shipped for Orlando power station, Johannesburg

panying picture shows the stator being lowered on to the deck of the floating crane at the quayside. A fifth set of the same rating is approaching completion, and a further five 37,500 kVA sets are being built, bringing the total capacity of this power station up to 422,500 kVA.

Seven G.E.C. turbo-alternators have, for many years, been in service in the neighbouring "City" power station, making a total capacity of G.E.C. generating plant in service or on order for the Municipality of Johannesburg of more than 572,000 kVA.

Scottish Window Competition

To mark the successful conclusion of a display and window-dressing competition organized between Service Centres, the South West Scotland Electricity Board recently held a commercial staff gathering. Each month during the past year the Service Centres have competed with one another to produce a winning window display based on a given theme, and results were published in the form of a league table. The competition was divided into two, League "A" for the larger Service Centres and League "B" for the lesser ones. League "A" was headed by Annan (Dumfries and Galloway Sub-Area) and League "B" by Lanark (Lanarkshire Sub-Area). The chief commercial officer, Mr. J. Gogan, presented both winners with an engraved silver drinking bowl, known in the Gaelic as a "cuach," which is to become a trophy to be competed for annually. After the presentation Miss Elizabeth Gwillim, senior demonstrator in the Dumfries and Galloway Sub-Area, who recently returned from an E.A.W. Travelling Exhibition tour of the Netherlands, gave an interesting account of her experiences in Holland.

Goods Transport

The new edition of the "Transport Goods Guide," just published by Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1 (price 2s 6d, including postage), will be of the greatest utility to consignors of goods. Operators of "smalls" services, local carriers, long distance services, clearing houses, Road Haulage Executive district officers and railway district officers are listed in A.B.C. form. Home shipping services (coastwise and to the islands), ferry services, the country's canal network, conveyance of liquids in bulk, and heavy machinery carriers are dealt with in separate sections, while details are also included of warehouse accommodation, London's wharves and operators of air services.

Switchgear for New Zealand

A tender for the supply and delivery of 11 kV switchgear for the Fendalton main substation has been accepted by the Christchurch (N.Z.) City Council. The gear consists of four incoming feeder units, twelve outgoing feeder units and the necessary bus coupler and bus section switch units. The tenderers were A. D. Riley & Co., agents for Ferguson, Pailin, Ltd., of Manchester, who have supplied a large quantity of high-voltage switchgear for the Christchurch system. Reporting on the tenders, the Electricity Committee said that first cost was of less importance than high quality of equipment. The higher price of the recommended tender would be fully justified by future maintenance and operating experience.

English Electric Television Exhibition

The television exhibition held recently by the English Electric Co., Ltd., at its Queen's House, London, showrooms, was visited by 50,000 people.

Training Within Industry

The North West Region of the T.W.I. Association, which is concerned with the training of supervisors in industry, has published a "Follow-Up," booklet which contains reports of the sub-committees for textiles, heavy engineering and chemicals, and oils and fats. This publication is supplementary to the Follow-Up booklet issued in 1947. Copies can be obtained from Mr. F. A. J. Taylor, hon. treasurer, Bleachers' Association, Ltd., Blackfriars House, Parsonage, Manchester, at 2s 9d, post free.

Packing Fluorescent Tubes

Manufacturers of fluorescent lamps have had difficulty in finding a satisfactory method of packing fluorescent lamps to avoid breakage. We have now received from Micramatic, Ltd., of Congleton, Ches.,

Recent Fluorescent Lighting Installations (see opposite page)

(1) Benjamin "Fluoroliers" installed in the new drawing office of the Metropolitan Water Board, Rosebery Avenue, London (Benjamin Electric, Ltd.). (2) Cold cathode lighting in the silk and rayon factory of G. H. Heath & Co., Ltd., Macclesfield (Metropolitan-Vickers Electrical Co., Ltd.). (3) Warm-white lamps at the Christmas fair of Frederick Gorringe, Ltd., Buckingham Palace Road, London, S.W. (Ekco-Ensign Electric, Ltd.). (4) Example of joint planning of decoration and lighting in the staff canteen of Crompton Parkinson, Ltd., Crompton House, Aldwych, London, W.C.2 (Crompton Parkinson, Ltd.) (5) Specially designed fittings for Jax Stores (ladies wear), Oxford Street, London, W. (Thorn Electrical Industries, Ltd.). (6) Corrosion-resisting Mazda fittings in the kitchen of the new canteen of the Furness Shipbuilding Co., Ltd., Haverton Hill, Co. Durham (British Thomson-Houston Co., Ltd.).

a sample of carton which they have evolved in collaboration with their advertising consultant, Mr. A. Burns, for the U-shaped tubes which they manufacture. This is in three sections, provided with locking devices and safety packing pieces to prevent all movement of the contents.

E.D.A. Activities

The national finals in the E.D.A. Public Speaking Competition will be held in the Lighting Service Bureau, 2, Savoy Hill, London, W.C.2, on 20th April. There will be seven competitors in the women's section and three men finalists. On this occasion the national winners will be presented with the Faraday Challenge Shields, which will be held for a year by the respective Area Board and with a small plaque, inscribed with name, date, etc., which will become their personal property.

The examinations have been completed in the salesmanship training course conducted by the E.D.A., and 166 candidates have been awarded the E.D.A. Domestic Electricity Salesmanship Certificate. Eight candidates passed "with distinction."

Shopkeeper Beats Board

Nearly a year ago the Southern Electricity Board sought to acquire compulsorily the shop premises of Mr. H. Lee, of Wokingham, Berks. Mr. Lee said that he was prepared to accept £8,000 for the shop,

which the Board wished to convert into a showroom, but the Board was prepared to pay only the district valuer's figure, which was about half that amount.

Mr. Lee appealed to the Ministry of Fuel and Power which held an inquiry into the matter. As a result of this the Ministry has declined to confirm the compulsory purchase order made by the Board.

A.B.O.E. Belgian Company

British Oil Engines Société Anonyme has been formed, with offices at 64, Boulevard Emile Jacqmain, Brussels, to sell in Belgium diesel engines made by firms in or associated with the Associated British Oil Engines Group—Mirrlees, Petter, McLaren, Meadows, Petter-Fielding, National—and the turbines and electrical products of the Brush Electrical Engineering Co. The directors of the new company are: The Hon. A. C. Geddes, Dr. J. W. Bondi, Mr. A. H. Syme, and Mr. M. Antoine Buysse.

"Carron Cupola"

The first number of "Carron Cupola," the magazine of Carron Company, Falkirk, contains a mixed and interesting fare. Besides the usual reports of social activities there is an article on Stirling Castle and a description of the company's heavy foundry. Progress is recorded of the suggestions scheme introduced last autumn and there is a page of photographs of recent overseas orders. The use of a kettle holder attachment for the company's H series electric cookers is illustrated.

Bakelite Exhibition

An exhibition of "Bakelite," "Warerite" and "Vybak" plastics will be held in the Exhibition Rooms of the British Colour Council at 13, Portman Square, London, W.1, from 9th to 17th March. The central feature will be the Bakelite, Ltd., travelling exhibition, which has recently been shown in Brussels, Oslo and Stockholm. In addition, a number of larger items will be included which it was not possible to send overseas. The exhibition is designed to illustrate the wide range of applications of plastics to industry. Admission will be by ticket only, and applications should be sent to Bakelite, Ltd., 18, Grosvenor Gardens, London, S.W.1.

A Topical Display

An effective display which ties up with the forthcoming General Election has been arranged by the Simplex Electric Co., Ltd., at its Birmingham branch. This consists of posters on a dummy wall telling electors to vote for "Binks," "Jinks" or "Bloggs," but above all to vote for "Creda," which is described as "the best cooker by General Election." One of the company's cookers, of course, completes the display.

Marconi's Argentine Contract

Reuter reports from Buenos Aires that Marconi's Wireless Telegraph Co. has secured a £125,000 contract for two 100 kW broadcasting transmitters in the face of competition from the United States and Dutch manufacturers.

Ball Bearing Company's Celebrations

The Skefko Ball Bearing Co., Ltd., reaches its fortieth birthday this year and to commemorate the occasion a well-produced brochure has been issued giving the history of the company, with illustrations of its works, products and social welfare activities. Particulars are given of financial grants which are to be made for the welfare of employees and a special programme of entertainments.

Trade Announcements

An Irish branch office has been established by **Fitzgibbon & Murray, Ltd.,** for all their electrical accessories. The address is c/o Mr. D. J. McKenna, Corn Exchange Buildings, Burgh Quay, Dublin.

It is announced that **Low Moor Alloy Steelworks, Ltd.,** has joined the BESTEC Export Group (British Engineers Small Tools & Equipment Co.. Ltd.).

Electronic Components has removed to Weedon Road Industrial Estate, Northampton (telephone: Northampton 2467).

The telephone number of the Brighton office of **British Insulated Callender's Cables, Ltd.,** has been changed to Brighton 29212/3.

Mr. T. C. Bell has recently joined the **Revo Electric Co., Ltd.,** as representative at the company's Newcastle branch.

Industrial Relations

The Industrial Administration Group, a section of the Students' Union of the Birmingham Central Technical College, has published "A Concise Guide to Industrial Relations," by T. Wylie. This short but comprehensive summary of the formal channels by which industrial relationships are conducted in Great Britain deals with the principles of the modern collective agreement between employer and workpeople, the duties of trade union officials, conciliation and arbitration, joint consultation and

finally industrial relations at international level. Copies of the guide (price 2s) can be obtained direct from the Industrial Administration Group of Central Technical College, Suffolk Street, Birmingham, 1.

Marconi Training

Two well produced brochures have been published by Marconi's Wireless Telegraph Co., Ltd., dealing with the company's schemes for apprenticeship training and post-graduate training in radio engineering. "Marconi Training" is the second of a series on apprenticeship within the English Electric group of companies and gives full particulars, with some excellent illustrations, of the scope and conditions of the company's scheme for training apprentices. The other booklet, "Marconi College" deals with the facilities available not only to young engineers joining the Marconi Co., but also to nominees of associated companies and clients from all parts of the world.

Gas-Turbine Locomotive Trial

Last week the 2,500 h.p. gas-turbine electric locomotive described in the *Electrical Review* of 13th January arrived in this country and on Monday last was given a trial run between Swindon and Badminton. A speed of 70 m.p.h. was reached and performance was reported to be satisfactory.

Catalogues and Lists

The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.—Priced and illustrated catalogue of gas-filled projector lamps.

Simplex Electric Co., Ltd., Broadwell, Oldbury, Birmingham.—Price list (L1791) of light equipment, excluding flameproof fittings.

British Thomson-Houston Co., Ltd., Rugby.—Priced catalogue of the entire range of "Mazda" lamps.

Arrow Electric Switches, Ltd., Hanger Lane, London, W.5.—Technical folder on heavy-duty tumbler switches.

A. Reyrolle & Co., Ltd., Hebburn, Co. Durham.—Pamphlet No. 824 describing HH unit-type metal-clad distribution gear for which the company has announced reduced prices.

Telegraph Construction & Maintenance Co., Ltd., Telcon Works, Greenwich, London, S.E.10.—Technical folder on "Telcon" anti-static television aerial feeders and screened microphone leads.

Stokes Appliances, Ltd., 16, Dingwall Road, Croydon, Surrey.—Priced folder on electically operated decorative fountains.

Metallurgical Research

THE present rate of development in the engineering industries often demands the use of special metals and alloys, but without the work which is being done by metallurgists many projects would be virtually impossible. This state of affairs is realized by the British Non-Ferrous Metals Research Association which, since its inception in 1921, has been actively engaged on behalf of industry in all manner of metallurgical problems.

The Association's laboratories comprise a group of buildings which are situated in Euston Street, London, N.W.1, and during the war, unfortunately, one particular block suffered considerable damage by bombing. This has now been remedied by reconstruction and has permitted the installation of new equipment and the rearrangement of existing work to provide a range of laboratories suitable to the present needs of the Association.

These new laboratories were officially opened on Monday of this week by Sir Ben Lockspeiser, Secretary of the Department of Scientific and Industrial Research, who said that in one way the bomb damage was a blessing in disguise and that with its present annual income of £90,000 and staff of 120 scientists and assistants, the Association was just the right size for the job. Referring to the problem of corrosion he said that great credit was due to the Association for the work which it had done for the Royal Navy in the field of boiler and condenser tube development. It had also contributed much towards the production of non-ferrous castings. In conclusion, Sir Ben forecast an important future for titanium which, with a density of about half that of steel, a very high melting point, and a tensile strength of 60-70 lb/sq in without particular purity, might be used for gas-turbine blades and the like.

Consulting Engineers

WE have just received a copy of a 197-page publication entitled "Who's Who of Consulting Engineers" which is obtainable from the Association of Consulting Engineers, 36, Victoria Street, London, S.W.1, price 10s 6d to members or 21s to non-members.

This well-produced book contains information regarding the Association and describes the functions and duties of consulting engineers in general. Apart from a list of chairmen and the names and addresses of non-practising members the book contains comparatively detailed particulars of individual members and firms of consulting engineers.

ELECTRICITY SUPPLY

Extensions at Pinkston

Effect of Power Cuts on Shipbuilding

OUR Glasgow correspondent states that the Corporation Transport Committee has recommended the appointment of a consultant to advise on the tenders received for the provision of a turbo-alternator at Pinkston power station, particularly as to the advisability of placing part of the contract (the condenser) with a Scottish firm. It was originally proposed to place the whole contract, amounting to £285,229, with the Metropolitan-Vickers Electrical Co., Ltd., but it was agreed to consider representations by two Glasgow engineering firms and trade union representatives that an opportunity to share in the contract should be afforded to Scottish firms. The contract for the condenser would amount to about £100,000.

Tees-side Plant Shortage

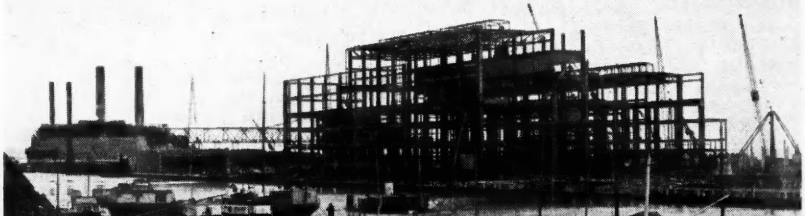
The Tees-side Industrial Development Board has drawn the attention of the Regional Board for Industry to the gravity of the electricity supply position on Tees-side. A special committee of the Board has reported that unless additional electricity is available next winter there will be serious interference with industry. The North Eastern Electricity Board states that 120,000 kW of additional generating plant is being installed at the North Tees power station, and other schemes are in hand for further extensions to give a total addition of 240,000 kW, but the first 120,000 kW will not be ready in time for next winter. The Tyne Shipbuilders' Association, which includes shipyards on the Tyne, Tees, Blyth and Hartlepools, has issued a statement pointing out the effect of power cuts. During the period from 1st September to 31st December last year, 98,500 hours in respect of manual workers had been lost through power cuts. In the same period, engineering concerns lost 144,000 hours, making a total of 242,500 hours.

Rural Activities

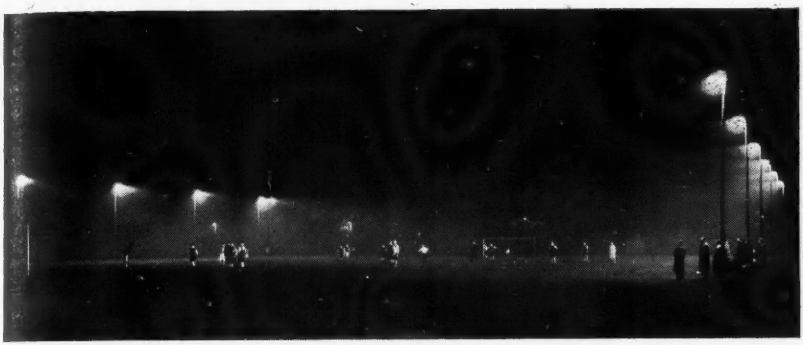
A note in the "Eastern Electricity Bulletin" records experiments in the electrical de-horning of calves carried out by a farmer in the Luton district. When the treatment was applied at six weeks of age it was found that the horns continued to grow, but de-horning at three weeks appears to have a more permanent effect. It is now being tried on three-day-old animals.

At Boxted, in the Suffolk Sub-Area, a 1,000-hen laying battery in which cleaning, watering and food supply are automatic, has recently been connected to the Board's system.

An advice bureau held every Tuesday at the Corn Exchange, King's Lynn (Norfolk Sub-Area) has proved popular with the public and is providing valuable aid to good relations with the agricultural community.



This photograph, taken last week, shows the progress which has been made in the construction of the Brighton "B" station at Southwick which is to house three 52.5 MW generating sets.



Excellent results have been obtained at the Ipswich Town Football Club's practice ground from an installation carried out by the Eastern Electricity Board. This comprises twelve Benjamin "Duoflux" floodlights mounted on 30ft poles. Benjamin floodlights are also used at Wembley

The Board has had a similar stand at the Corn Exchange at Bury St. Edmunds (Suffolk Sub-Area) for some twelve months.

Gas Showroom Lighting

The Chilterns Sub-Area of the Eastern Electricity Board is supplying and installing fluorescent lighting fittings for general and window lighting in the Aylesbury showrooms of the Southern Gas Board.

B.E.A.'s North Wales Bill

The *Western Mail* reports that at a meeting of the River Conway Fishery Board on Monday last a letter from the Ministry of Agriculture and Fisheries was read. This stated that the British Electricity Authority was preparing a Private Bill in connection with hydro-electric development in North Wales to be deposited in the autumn and which it was hoped would become law in the summer of next year.

The Authority was anxious to meet bodies likely to oppose the scheme in order to arrive at the safeguards to be included in the Bill and a conference between the Authority and those concerned would be held at Chester soon.

Salvador Project

A proposed hydro-electric scheme on the River Lempa, El Salvador, provides for the construction of an underground power station (Guayabo) which will house two 21,000 h.p. horizontal shaft turbines. The dam will be about 64 metres high and nearly 500 metres in length, and will inundate about 20 sq miles of land. The power plant, housed in an excavation in the rocks, will operate under a head of 49 metres. The River Lempa Commission is preparing lists of firms from whom tenders will be accepted and any U.K. firms wishing to be included should send details of their qualifications by air mail to H.M. Minister and Consul-General, British Legation, San Salvador. No further additions will be made to the lists after the end of February. The scheme is described in circular CRE 111381/49 COM/2482A/Ib1 of the B.O.T. Commercial Relations Department, Thames House North, Millbank, S.W.1.

School Installations

The London County Council Education Committee proposes to invite tenders for the electrical installations in eight primary and secondary schools and two special schools in the second group of the fourth programme. The estimated cost is £30,000, of which £3,500 will be incurred in the current financial year, £26,000 in 1950-51, and the balance in 1951-52.

S.W. Scotland Board's Report

Mr. James Gogan, chief commercial officer of the South West Scotland Electricity Board draws our attention to an error in Table II on page 263 of our issue of 10th February. The average price obtained by the Board from two-part domestic consumers, shown as 1.94d, should be 0.94d. He adds that the Board is rather proud of the figure since it is the lowest in the country for this class of supply.

Street Lighting Improvements

Tipton Corporation is applying to the Ministry of Health for consent to borrow £16,160 for lighting a number of streets by electricity.

Ship Propulsion

Considerations in Electrical Transmission

IN the twenty-second Thomas Lowe Gray Lecture at the Institution of Mechanical Engineers Mr. James Gray (chief superintendent engineer, Union Castle Mail Steamship Company) reviewed faults in design, workmanship, and the operation of mail service ships.

In considering the efficiency of the modern passenger liner he said that the choice of propulsion to-day was between steam-turbines with mechanical gearing, turbo-electric, and direct diesel propulsion (the diesel-electric alternative was omitted because it promised little peculiar benefit in other than special types).

Electric transmission had somewhat intermittently found favour as the alternative to mechanical gearing for a conjunction of turbine and propeller efficiency. Whereas conversion loss in mechanical gearing might be estimated at 2 per cent, that in electric transmission might be an additional 5 per cent, against which could be offset the gain from the elimination of astern turbines, always a possible site of trouble through changing heat stresses when manœuvring, air leakages to condenser, and interference of the exhausts of ahead and astern turbines.

Turbine Efficiency

Electric transmission also allowed a more efficient turbine on account of higher speed and offered more favourable conditions for reheating the steam in the cycle, an economy proved in power stations, but not so far widely used in marine engineering. It also provided full astern power, or, more exactly, equivalent astern and ahead power, since in the case of water-tube boilers the need for constant adjustment of evaporation and superheat during manœuvre made it possible to provide only a fraction of full power in response to the varying, unforeseen and brief requirements from the bridge; so development of power in answer to each call was gradual, whether ahead or astern. Further, electric transmission was more economical at fractional speeds; this, however, was generally of small benefit in overall economy, while the factors against turbo-electric machinery were the greater space required and its weight and cost.

Reheat was not considered practicable in conjunction with astern turbines, which were essential with normal mechanical gearing. The overall fuel consumption of turbo-electric machinery without reheat would almost certainly be greater than that of geared turbines without reheat; with electric transmission and reheat, consumption was likely to be slightly lower. The difference was small, perhaps 2 per cent each way on a fuel cost which, before devaluation, might be estimated at 15-20 per cent of the whole cost of the service (since devaluation, adjustment of fuel oil prices had increased this to over 25 per cent). Thus, there would appear to be small return for the additional cost and space required.

At sea the peak demand made by electrical power for all uses would be 10-15 per cent of the power of the main engines, while the peak demand in port was approximately one-half to two-thirds of that at sea. The installed capacity of turbo-generators might be approximately 50 per cent over the maximum demand at sea and that of diesel generators about 100 per cent.

For port use in steam-driven vessels diesel generators were preferable, as they permitted, first, the prompt and complete shutting down of the main boilers for cleaning, examination and repair and, secondly, a great reduction in fuel consumption compared with that of a high-pressure boiler operating at fractional load. Turbo-generators had the advantage when conditions at sea made it possible to achieve economy by steam propulsion, as less constant attention was required from the operating staff.

A compromise between sea and port requirements gave the advantage to turbo-generators to carry the maximum sea load in the larger steam-propelled vessels, with diesel generators to carry the port load, one machine in reserve, and the whole diesel equipment as reserve at sea for the turbo-generators. Where space permitted this arrangement might entail a separate generator room to ensure sub-division. For lower steam powers economy in space might suggest, and sub-division requirements permit, the siting of the generators in the main engine room, so the compromise might thus result in diesel generators only.

Public Lighting Lectures

Three Cantor Lectures are to be given at the Royal Society of Arts, John Adam Street, Adelphi, London, W.C.2, by Mr. J. M. Waldram on "Public Lighting." The first will be given on Monday next, and the other two on 27th February and 6th March.

FINANCIAL SECTION

Company Notes and Stock Exchange Activities

REPORTS AND DIVIDENDS

Sterling Electric Holdings, Ltd., reports a group trading profit for the year ended 31st March last of £88,130, as compared with £60,469 for the preceding year, to which is added surplus on sale of freehold properties, making £109,962. After providing for depreciation, interest, etc., there is a net profit for the year of £57,391 (against £42,865), to which is added £45,834 brought in and £1,679, provision for price adjustments written back, making £104,904 available. Taxation requires £19,352, and after deducting interest on 4 per cent funding certificates, preference dividend and placing £2,621 to funding certificates redemption account, a balance of £74,401 is carried forward. No ordinary dividend is proposed. The profit of the parent company for the year is £23,957 (against £15,227).

In his statement isued with the report and accounts, Sir Albert N. Braithwaite (chairman) says that the combined turnover for the year shows an increase over 1948 largely represented by the substantial improvement in Diesel engine production and sales. With regard to the manufacture and sale of electrical, industrial and domestic appliances through the Sterling Engineering Co., Ltd., and Electrix, Ltd., a net profit was made despite difficulties during the year. A large proportion of the group's production was exported, and in order to obtain a greater volume of business it was necessary to reduce selling prices to compete with the keen prices quoted by home and foreign competitors but the restrictions on imports by foreign countries and the granting of import licences represent a constant problem.

The Calcutta Electric Supply Corporation, Ltd.—The lists opened and closed in London on Tuesday last of an offer for sale by Lazard Brothers & Co., Ltd., of £3,000,000 5 per cent debenture stock 1970, at £98 per cent. Simultaneously, £2,000,000 of stock was being offered in India.

The Madras Electric Supply Corporation, Ltd.—In a circular to stockholders the directors state that while the price to be paid by the Government of Madras for the undertaking has not yet been finally determined, the position has now been reached where the Corporation is free to apply a portion of the sum paid on account of the purchase price to the repayment of the preference capital. An extraordinary meeting is to be held on 3rd March to consider resolutions for the reduction of capital.

The Westinghouse Brake & Signal Co., Ltd., reports a group trading profit for the year to 1st October last of £491,213, an increase of £23,612 as compared with the 53 weeks to 2nd October, 1948. After providing for loan interest, taxation, amounts retained in subsidiary companies, etc., the net profit of the parent company is £171,932 (against £162,740), to which is added £10,039 adjustments relating to earlier years. After making allocations totalling £95,000 to various reserves, it is again proposed to pay a dividend for the year of 14 per cent. The balance carried forward is £99,651 (against £99,103 brought in).

The Parsons Engineering Co., Ltd., reports a trading loss of £10,961 for 1948-49, as compared with a loss of £10,443 for the previous year, and after providing £9,525 for depreciation, the debit balance carried forward is £33,715 (against £8,378).

Electrical Components, Ltd., has declared an interim dividend of 7½ per cent actual, less tax, on account of the year ending 31st March last. Last year 3½d per share for nine months ended 31st March, 1949 was paid (approximately the same rate).

NEW COMPANIES

Mullard Overseas, Ltd.—Registered 4th February. Capital £250,000. Manufacturers, importers and exporters of, dealers in and agents for the sale of radio valves and apparatus, electric lamps, electric discharge tubes, etc. Directors: S. R. Mullard, S. S. Eriks, A. V. Harvey, W. Benink and A. W. Welton. Regd. office. Spencer House, South Place, E.C.2.

Ega Developments, Ltd.—Registered 21st January. Capital £10,000. Wholesalers and retailers of electrical, radio, television and mechanical apparatus, appliances and accessories, etc. Directors: C. H. Bennett, Arbretta, Holyhead Road, Kingswood, nr. Wolverhampton; W. T. Riley; and F. A. W. Payne.

Wilsons (Wood Green), Ltd.—Registered 20th January. Capital £5,000. Electrical engineers and general electrical installation contractors, etc. F. N. Wilson is first and permanent director. Reg. office: British

Railways Goods Depot, Station Road, Wood Green, N.22.

Butler Radio Manufacturing Co. (Rochester), Ltd.—Registered 20th January. Capital £500. To acquire the business of radio and television manufacturers, etc., carried on by F. T. Butler and N. P. Williams, at 17, Five Bells Lane, Rochester, as Butler Radio Mfg. Co. Directors: F. T. Butler and N. P. Williams. Reg. office: 34, High Street, Chatham, Kent.

Supersonic Services (Southern), Ltd.—Registered 25th January. Capital £2,000. Manufacturers of and dealers in radio and television sets, electrical apparatus, etc. Directors: E. A. Gurmain, J. C. Wadams, I. C. W. Hamilton-Irvine and L. C. F. Down. Regd. office: 46b, Southbourne Grove, West Southbourne, Bournemouth.

Francis X. Pichler, Ltd.—Registered 5th January. Capital £1,000. Electricians, mechanical engineers, etc. Directors: F. J. X. Pichler and H. R. Coley. Regd. office: 18, Cecil Square, Margate.

Business Radio (Manchester), Ltd.—Registered 2nd February. Capital £5,000. Subscribers: J. A. Cowell and D. A. Povey. Regd. office: 56a, Mosley Street, Manchester.

Business Radio (Newcastle), Ltd.—Registered 2nd February. Capital £5,000. Other particulars similar to Business Radio (Manchester), Ltd. Regd. office: 13, St. Mary's Place, Newcastle.

G.B.M. (Electrical), Birmingham, Ltd.—Registered 2nd February. Capital £100. Designers, manufacturers and repairers of and dealers in electrical, radio and telephone apparatus and accessories, etc. Directors: M. Mitchell and L. Brown. Regd. office: 55, Temple Row, Birmingham.

R.V. Battery Separator Co., Ltd.—Registered 7th February. Capital £3,000. Manufacturers of and dealers in separators for use in lead-acid batteries, etc. Directors: R. H. Vaissiere and G. J. Robertson. Regd. office: Victoria Works, High Road, Whetstone, N.20.

INCREASES OF CAPITAL

Yorkshire Switchgear & Engineering Co., Ltd.—Increased by £50,000, in £1 ordinary shares, beyond the registered capital of £30,000.

Phœnix Telephone & Electric Works, Ltd.—Increased by £100,000, in £1 ordinary "C" shares, beyond the registered capital of £50,000.

Power Plant Co., Ltd.—Increased by £100,000, in 50,000 ordinary and 50,000 five per cent first cumulative redeemable preference £1 shares, beyond the registered capital of £100,000.

Crompton Parkinson, Ltd.—Increased by £1,350,000 in 5s "A" ordinary shares, beyond the registered capital of £2,850,000.

LIQUIDATIONS

Weldona Electrical Appliances, Ltd., lately of Upper Lewes Road, Brighton.—A meeting of creditors was held recently when a statement of affairs was submitted which showed liabilities amounting to £775. The assets were estimated to produce £299 and, after allowing for the preferential claims, there were net assets of £257, leaving a deficiency as regarded the creditors of £518. The issued share capital amounted to £400 and, so far as the shareholders were concerned, there was a total deficiency of £918. A resolution was passed confirming the voluntary liquidation of the company with Mr. A. E. Orbell, accountant, of 6 and 7, Old Steine, Brighton, as liquidator.

BANKRUPTCIES

A. Smith and **J. Smith,** formerly carrying on business in co-partnership at 550, Bolton Road, Pendlebury, Lancs., under the style of J. & A. Smith, electrical contractors.—Receiving order made 30th January on debtors' own petition.

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered within a month of 8th February.

WOLF ELECTRIC TOOLS (design). No. 673,190. Class 7. Portable electric machines for grinding, drilling, sanding, blowing, brushing, polishing, filing, sawing, screw-driving and nut setting.—Wolf Electric Tools, Ltd., Pioneer Works, Hanger Lane, London, W.5.

MEZ (design). No. 677,880. Class 7. Electricity generators, electric motors (not for land vehicles) and electric welding machines, and parts of all such goods included in Class 7.—Noravske Elektrotechnicke Zavody Narodni Podnik, Olomoue, Czechslovakia. Address for service c/o Reddie & Grose, 6, Bream's Buildings, London, E.C.4.

DYNO. No. 681,065. Class 7. Dynamos.—The Raleigh Cycle Co., Ltd., 177, Lenton Boulevard, Nottingham.

FARADEX. No. B680,822. Class 9. Electrical condensers.—Steatite Porcelain Products, Ltd., Imperial Chemical House, Millbank, London, S.W.1.

HELIKON. No. 684,225. Class 9. Wireless valves.—Helikon, Ltd., 234, Bishopsgate, London, E.C.2.

TAPEDECK. No. 684,413. Class 9. Apparatus for recording, reproducing and amplifying electric oscillations, and parts thereof included in Class 9.—Wright & Weaire, Ltd., 138, Sloane St., London, S.W.1.

FINANCIAL SECTION

STOCKS and SHARES

THE behaviour of the Stock Exchange market in British Funds is causing a good deal of perplexity, owing to the erratic character of fluctuations in its prices. The Consol market, as it is called, generally attracts particular notice at a time of a General Election because some people think, possibly quite wrongly, that the movements in its quotations afford some reflection of what result may be expected. Since a week ago, prices have given way slightly. There are rumours of Colonial borrowers being anxious to place loans of substantial amount. On the other hand, the volume of buying has contracted.

Decca Results

Decca Record 1s ordinary shares have picked up 3d, to 12s, since the appearance of the preliminary profits statement. They yield £9 7s 6d per cent on the dividend, maintained at 112½ per cent (for the third successive year) on the capital as increased by the private issue of half-a-million shares last August. Trading profit on this occasion comes out at 12½ per cent above the 1947-48 results. Taxation, increased charges, and dividends on the preference capital, leave £76,000 (apart from special items) available to pay the ordinary dividend costing £61,000. From the Decca Navigator and the American subsidiaries, expenses still exceed income, the difference being charged to development account, which now totals £682,000. In the current year, home trade is reported to have revived well, after a preliminary setback. The 5 per cent preference have recovered 1s to 14s 6d.

Electrical Equipment Financing

A review published this month by one of the leading Stock Exchange dealers in electrical equipment shares is concerned largely with capital requirements of the industry. To illustrate the results, for capital borrowers, of the relapse in gilt-edged prices, the firm refers to the issues by A.E.I. in 3¼ per cent 10 year notes at 98¾ last March; by G.E.C., in 3½ per cent notes at 99 four months later; and by English Electric in 4 per cent debentures at 99 this year. The writers are doubtful about the benefit of ordinary share offers on bonus terms, so long as dividend limitation persists. They point to Automatic Telephone's offer of new shares, last November, at 50s: previously, the old shares stood at 61s to yield 4 guineas per cent; they are now 53s 6d yielding £4 13s 6d per cent.

Suggested "Switches"

In summarizing the review mentioned above, the Stock Exchange authors conclude, first, that the trading background for electrical equipment investments remains extremely good: continuance of active business and satisfactory profits can be expected, although the latter may now be about their peak. Secondly, the need for additional capital is likely to continue. Bank indebtedness, they suggest, probably portends an issue; in which cases a low yield on the ordinary shares concerned, should be viewed with suspicion, unless dividend limitation is withdrawn. Finally, where there is shortage of capital and a yield of under 4½ per cent on the shares, they suggest switching into others that give a return of 5 per cent after a capital issue.

Calcutta Electric Issue

Calcutta Electric Supply Corporation's offer, this week, of £3 million 5 per cent debenture stock at 98, issues from the same stable as was responsible for the recent successful English Electric debenture offer. The yield of £5 2s—per cent at the issue price of the new debentures, comes up for comparison with returns equivalent to £7 6s 9d per cent gross on the company's 5 per cent preference, and to nearly 9¾ per cent, gross, on the £1 ordinary at 22s 6d. As to the cover for the new stock (together with another £2 million issued locally) the prospectus showed net assets 2½ times the amount of the debentures. Average profits of the last three years were 3½ times their interest requirements. Final redemption is due in 1970, when the Bengal Government will again have a purchase option.

The Week's Changes

Tube Investments have recovered 2s 6d to 5.11/16 and Aberdare Cables at 57s 6d are also ⅛ higher. Great Northern Telegraphs at 16 are a point to the good. Rises of 6d to 1s have occurred in Hoover, 36s, Crabtree, 33s 6d, British Vacuum, 8s 6d, Lucas, 26s, Anglo-Portuguese Telephone, 25s. On the other hand, Aron Electrics are down ⅛ at 33s 9d. Westinghouse Brake, 58s 6d, Jerusalem Electric and Palestine Electric, at 13s 3d and 27s 6d respectively, are lower on the week, and De La Rue shares at 22s 6d have lost 9d. Smaller falls left Associated Electrical 69s 6d, Ericssons, 39s 6d, E. K. Cole, 16s. Radio and Television florin shares are down to ninepence.

Rectifiers and Chargers

New Crypton Factory at Bridgwater

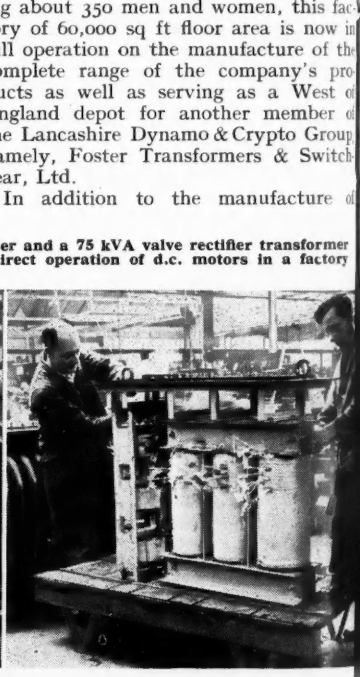
Apparatus awaiting test. In front on the left is a rectifier for operating the relays of an electric organ. The tall piece of apparatus in the background is a demonstration unit for the South-Eastern Engineering College, Glasgow. The other items are various types of battery chargers

IN 1940 the Park Royal factory of Crypton Equipment, Ltd., makers of rectifying, battery charging and automobile testing apparatus, was completely destroyed by bombing. Within three months production had restarted in an old garage at Bridgwater and so satisfied was the company with the facilities offered by the neighbourhood that it was decided when the opportunity arose to construct a new factory there.

Standing on a 7-acre site and employing about 350 men and women, this factory of 60,000 sq ft floor area is now in full operation on the manufacture of the complete range of the company's products as well as serving as a West of England depot for another member of the Lancashire Dynamo & Crypto Group, namely, Foster Transformers & Switchgear, Ltd.

In addition to the manufacture of

Assembling a 1,500 A 7½ V oil cooled plating rectifier and a 75 kVA valve rectifier transformer ordered by the Midlands Electricity Board for direct operation of d.c. motors in a factory



metal rectifiers in capacities up to approximately 20 kW the company is now producing mercury vapour rectifiers of similar capacity. Larger sizes of rectifiers are catered for by the company's associate, the Nevelin Electric Co., Ltd. These medium-power mercury vapour units incorporate a new type of bulb with a life three to four times those used before the war, tests showing a life of over 30,000 hours' continuous service. This increased life is due to the use of an entirely new design of the cathode, which is surrounded by a special cylinder preventing the heavy positive ions from bombarding and disintegrating the filament and thus greatly extending the life. Furthermore, to obviate backfiring, the anodes are treated with a specially prepared graphite which reduces the positive glow around the anodes and considerably improves stability.

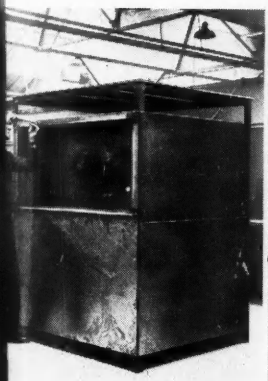
Efficiency, which is uniformly high at all loads from quarter to full load, is about 90 per cent for 230 V rectifiers and appreciably higher for the 460 V range. Regulation is normally within 5 per cent from full load to no load and even closer regulation can be provided where needed. Any required overload can be provided for to meet given requirements, the standard overload being 50 per cent for five seconds and 20 per cent for ten minutes. Power factor averages from 0.80 to 0.92 according to the a.c. supply and the circuit used. An auxiliary ignition unit provides for exciting the bulbs, while an automatic time delay of approximately one minute makes it impossible to apply a load to the rectifier until the bulb filaments are heated.

With such a varying range of products, although standardization of components is adopted wherever practicable, it is impossible to introduce mass-production methods and each job is therefore dealt with individually. When we visited the works recently, among the most interesting contracts in hand was a batch of battery chargers for use by the Steel Company of Wales, for electric vehicles used for conveying iron ore in its foundry.

Each battery comprises thirty-six lead acid cells of 1,500 Ah capacity and a maximum charging rate of 330 A is required. Housed in a sheet-steel kiosk measuring 6ft high, 4ft 6in wide and 4ft deep, the charger complete weighs 2 tons. A triple-pole isolator is incorporated, together with a 6in projector-type ammeter, an output control switch, a timing relay, two 350 A h.r.c. output fuses and auxiliary fuses. Two sets of cables are led out from each end, the batteries being split for charging purposes.

Among a large number of other types of battery chargers for industrial and motor trade use were 48-cell vehicle battery chargers for Balfour, Beatty & Co., Ltd.; constant-voltage units going up to 800 A (400 A each side); rotary-type

Constructing the kiosk for a large vehicle battery charger for the Steel Company of Wales, and (right) completed automobile test benches for use in motor car factories and garages



constant-voltage chargers; units employing "Tungar" rectifiers for South Africa; and a portable petrol-driven set. Other noteworthy items were Post Office telephone exchange sets, emergency lighting equipment complete with nickel-iron cells for the London County Council, constant-voltage apparatus for operating relays of an organ blower, a 1,500 A 7½ V oil-cooled plating rectifier, rectifier units ordered by the Midland Electricity Board for supplying d.c. in factories, and a metal rectifier required by the South-Eastern Engineering College, Glasgow, for general laboratory work.

All the sheet-metal work used in the factory is treated with "Jenolite" for derusting and rust prevention. This provides an ideal surface for the paint finish and, although adopted as a general process, is particularly suitable for apparatus intended for use overseas.

Apart from the rectifier and battery chargers, the company is also making at Bridgwater, in addition to its garage test benches, a new motor analyzer with the aid of which it is possible to check the whole equipment of a car within 1¼ to 1½ hours. This apparatus is obtainable in separate sections, comprising a coil tester, condenser tester, "Tach-Dwell" meter, combustion analyzer, vacuum and fuel-pump tester, compression gauge, timing light and h.t. tester.

AUSTRALIAN IMPORTS

General Increase in 1947-48

THE import trade of Australia in electrical machinery and appliances continues to progress in spite of the increase in the manufacture of such goods within that Commonwealth. Full particulars of this trade in 1947-48 have just been issued in Canberra. From them the accompanying statement giving the values of the

Table I.—Machinery, Switchgear, Wire and Cable, etc.

Class of Equipment	1947-48 £A(000)	Inc. or dec. on 1946-47
A.c. generator set units	73	+ 71
D.c. generator set units	50	+ 1
Alternators for turbines	150*	+ 79
Other alternators	58	+ 12
From United Kingdom	52	+ 8
,, *United States*	6	+ 4
Generators for turbines	16	− 10
From United Kingdom	4	− 6
,, *Germany*	10	+ 10
Other generators	65	− 7
Other current generating machines	9	− 3
Motors under 1 h.p., except as parts of machines	626	+282
From United Kingdom	306	+ 69
,, *Canada*	150	+ 73
,, *United States*	150	+121
Motors, 1 h.p. and over, a.c. induction (non-commutator type)	536	+342
From United Kingdom	435	+383
,, *Canada*	20	+ 20
,, *United States*	60	+ 23
Ditto, other	65	+ 25
From United Kingdom	49	+ 26
,, *United States*	14	+ 5
D.c. motors or gearless lifts	3	—
Traction motors	14*	+ 5
Other d.c. motors	158*	+ 88
Motors, universal	9	+ 2
Convertors, frequency changers and rotary transformers	145*	+136
Switch units above 15 kV	307*	+148
Lightning arrestors, other than radio	155†	+ 20
Liquid slip regulators, thrustors, etc.	153*	+ 73
Switches, cut-outs and choke coils	209	+ 82
From United Kingdom	125	+ 34
,, *United States*	79	+ 58
Voltage regulators, etc.	48	+ 29
From United Kingdom	8	—
,, *Switzerland*	9	+ 7
,, *Canada*	15	+ 10
Regulating and controlling apparatus	193	+ 77
From United Kingdom	136	+ 60
,, *United States*	54	+ 17
Rectifiers	83	+ 8
From United Kingdom	66	+ 15
,, *United States*	15	− 13
Static transformers, under 66 kV	43	+ 30
From United Kingdom	54	+ 48
,, *South Africa*	4	+ 4
Static transformers, 66 kV and over	137*	+136
Light and power cable, lead-covered and armoured, paper insulated	458	+383
Ditto, otherwise insulated	164*	+114
Other covered light and power cable	299	+ 91
From United Kingdom	289	+ 92
,, *United States*	10	+ 1
Telegraph and telephone cable and wire, lead covered and lead armoured and covered	386	+323
From United Kingdom	367	+308
,, *Holland*	19	+ 19
Other covered telegraph and telephone cable and wire	174	+118
From United Kingdom	136	+ 87
,, *Holland*	37	+ 37
Enamelled wire, not covered	70	+ 32
Ditto, covered	84	+ 38

* All or mainly from U.K.

† All or mainly from U.S.A.

Table II.—Electrical Goods and Apparatus

Class of Goods	1947-48 £A(000)	Inc. or dec. on 1946-47
Dry batteries and cells	11	+ 9
From United Kingdom	9	+ 8
„ United States	2	+ 2
Ditto, parts	2	+ 1
Storage batteries and parts	90	− 74
From United Kingdom	35	− 17
„ United States	52	− 30
Dynamos for motor vehicles, except magnetos	39	+ 24
Dynamos for cycle lighting sets	16	+ 4
Magnetos and dynamo magnetos as one unit	141	+ 78
Starter motors, 24 V and under, for motor vehicles	53	+ 34
Lamps, filament, automobile	99	+ 51
From United Kingdom	35	+ 16
„ United States	44	+ 17
„ Holland	18	+ 17
Lamps under 20 V, flashlight	19	− 1
From United States	2	− 6
„ Canada	6	+ 3
„ Hong Kong	5	− 1
Other lamps under 20 V	56	+ 24
From Holland	14	+ 4
Lamps 20 V and over, gas-filled, metal filament	27	+ 4
From United Kingdom	13	+ 5
„ United States	10	− 3
Other lamps 20 V and over, m.f.	59	+ 13
From United Kingdom	24	+ 10
„ United States	19	− 3
„ Holland	12	+ 6
Mercury vapour, etc., tubes	103	+ 86
From United Kingdom	77	+ 62
„ Holland	16	+ 16
Electric vacuum tubes	15	+ 10
From United Kingdom	7	+ 6
„ Holland	4	+ 4
Heating and cooking appliances:		
Stoves, cookers and the like	385*	+305
Radiators, toasters and kettles	79*	+ 37
Other	65	+ 31
From United Kingdom	48	+ 20
„ New Zealand	10	+ 9
Measuring and recording instruments	221	+ 49
From United Kingdom	148	+ 46
„ United States	57	− 5
„ Switzerland	1	− 6
Telegraph instruments and appliances	105	+ 8
From United Kingdom	9	—
„ United States	95	+ 80
Telephones	412	+206
From United Kingdom	284	+ 84
„ United States	124	+119
Telephone switchboards, automatic	99	+ 42
Telephone and telegraph switchboards and appliances, n.e.i.	752	−111
From United Kingdom	704	− 25
„ United States	48	−104
Radio valves	406	+159
From United Kingdom	14	+ 48
„ United States	117	+ 13
„ Canada	20	− 10
„ Holland	54	+ 7
Radio receiving sets	64	+ 57
From United Kingdom	44	+ 43
„ United States	17	+ 13
Transmitting sets	48	+ 44
From United Kingdom	15	+ 13
„ United States	30	+ 29
Radio parts	122	− 1
From United Kingdom	54	+ 6
„ United States	40	− 16
Electrical apparatus, n.e.i.	423	+189

* All or mainly from U.K.

principal items has been drawn up, with notes of increases or decreases (very few) on 1946-47 added.

Holland has returned to the market in her well-established lines and some other countries of Continental Europe have been competing in the motor trade. The total value of the imports of electrical appliances and equipment rose from £A4,820,000 in 1946-47 to £A10,308,000 in 1947-48. Provisional figures for 1948-49 show a total of £A17,212,000—more than three and a half times the value of imports recorded three years previously.

CONCRETE DUCT CONSTRUCTION

A PRODUCT of American origin named "Ductube" for the moulding of ducts in concrete is now being produced in England and is available from Wiggins-Sankey, Ltd., Lysia Street, Fulham, S.W.6. It can be used for moulding ducts of up to 3in diameter in any type of concrete, whether aerated, reinforced, plain, or vibrated, and consists essentially of two concentric rubber tubes between which is a diagonally braided fabric core. When the tube is inflated its length decreases by about 15 per cent and because one set of the diagonal fibres is braided with a slightly greater tension than the other a twisting movement is produced over the length of the tube. In use the "Ductube" is inflated with air (50-70 lb/sq in) to the size required, laid in the mould or shuttering, tied as required and the concrete poured. When it is set the tube is deflated and withdrawn for re-use. Although no definite figures for the life of "Ductubes" can be quoted, it is likely that they can be used for several hundreds of mouldings and still remain serviceable. They are made in 6oft lengths, and in four diameters to produce finished ducts of 1, 1½, 2 and 3in diameter. Owing to the shrinking produced by inflation the 6oft length of tube becomes a working length of 5oft. Longer runs can be made by joining two lengths of tube, setting a piece of conduit over the joint, and withdrawing the tube from either end.

NEXT WEEK'S EVENTS

Monday, 20th February

BIRMINGHAM.—Grand Hotel, 6.15 p.m. Birmingham Electric Club. "The Manufacture of Lighting Glass," by J. G. Holmes.

LIVERPOOL.—At the Royal Institution, Colquitt Street, 6.30 p.m. I.E.E. Mersey & North Wales Centre. "The Measurement of Light & Colour," by G. T. Winch.

LONDON.—Savoy Place, W.C.2, 7 p.m. I.E.E. London Students' Section. Address by the President, Prof. E. B. Moullin.

St. Ermins Hotel, S.W.1, 6.50 p.m. A.S.E.E. Central London Branch. "Electrical Contracting," by W. F. Parker.

NEWCASTLE-ON-TYNE.—King's College, 6.15 p.m. I.E.E. North-Eastern Radio & Measurements Group. "Theory and Design of Magnetic Amplifiers," by H. M. Gale and P. D. Atkinson.

Tuesday, 21st February

LEEDS.—Lighting Service Bureau, 24, Aire Street, 6.30 p.m. I.E.E. North Midland Utilization Group. "Technical Considerations affecting the Development and Design of Electrical Control Gear for Machine Tools," by A. R. H. Thorne.

LIVERPOOL.—Electricity Board's showroom, Whitechapel, 6 p.m. I.E.S. Liverpool Centre. "Cold Cathode Lighting Equipment," by E. A. Langsdon.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Measurements Section. Discussion on "Electrical Methods of pH Measurement," opened by G. I. Hitchcox and G. R. Taylor.

Lighting Service Bureau, 2, Savoy Hill, W.C.2, 6.30 p.m. Association of Supervising Electrical Engineers. "Electricity & Heat Supplies from Thermal Electricity Generating Plant," by C. G. Carrothers.

LOUGHBOROUGH.—The College, 6.30 p.m. I.E.E. East Midland Centre. Junior members' night.

MANCHESTER.—Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North-Western Supply Group. "The Design, Specification & Performance of High-Voltage Surge Diverters," by H. F. Jones & C. J. O. Garrard.

Wednesday, 22nd February

EDINBURGH.—Welfare Club Hall, City Lighting & Cleansing Dept., 7 p.m. I.E.S. Edinburgh Centre. "The Illuminating Engineer's Approach to Lighting Problems," by W. T. Souter.

FARNBOROUGH.—R.A.E. College, 6.30 p.m. I.E.E. Southern Centre. "A Royal Air Force Calibration Centre," by W. H. Ward.

LEWISHAM.—S.E. London Technical College, 8 p.m. A.S.E.E. South-East London Branch. "Telephone Exchange Work," by W. H. Dibbin. (Joint meeting with S.E. London Electrical Engineering Society.)

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Supply Section. "The Cost and Efficiency of Earthing on Low-and Medium-Voltage Overhead-Line Systems," by L. Gosland. (Joint meeting with Utilization Section.)

I.E.E. London Students' Section, 2.30 p.m. Visit to P.O. (London) Railway, E.C.1.

Café Royal, W.1, 12.30 for 1 p.m. Institute of Welding. Luncheon.

LUTON.—George Hotel, George Street, 7.45 p.m. A.S.E.E. Luton Branch. "Factory Distribution and Layout," by W. F. Parker.

MANCHESTER.—Engineers' Club, Albert Square, 6.30 p.m. I.E.E. North-Western Radio Group. "Printed Circuits, including Miniature Components and Sub-Miniature Valves," by J. E. Rhys-Jones and G. W. A. Dummer.

Thursday, 23rd February

GLASGOW.—At the Institution of Engineers & Shipbuilders, 7 p.m. I.E.S. Glasgow Centre. "Colour in Industry," by S. A. Wood.

LONDON.—Connaught Rooms, Great Queen Street, W.C.2, 7 for 7.30 p.m. Institution of Electrical Engineers. Annual dinner.

NOTTINGHAM.—Gas Board's demonstration theatre, 5.30 p.m. I.E.S. Nottingham Centre. "Lighting for Photography," by G. A. Jones.

RUGBY.—Electricity Showroom, High Street, 6.30 p.m. I.E.E. Rugby Sub-Centre. "Some Problems in Aircraft Magneto Development," by R. T. Coe and D. F. Welch.

Friday, 24th February

LONDON.—Storey's Gate, St. James's Park, S.W.1, 5.30 p.m. Institution of Electrical Engineers. "The Application of Gas-Turbine Technique to Steam Power." J. F. Field. (Joint meeting with the Institution of Mechanical Engineers.)

NEWCASTLE-ON-TYNE.—King's College, 7 p.m. I.E.E. North-Eastern Students' Section. "Switchgear," by T. W. G. Hart and K. W. Stanger.

STOKE-ON-TRENT.—Midlands Electricity Board Service Centre, Kingsway, 7 p.m. E.P.E.A. Midland Technical Group. "Television," by I. N. Vaughan Jones.

Saturday, 25th February

BARNSLEY.—Queen's Hotel, 3 p.m. Association of Mining Electrical & Mechanical Engineers, Yorkshire North-West Branch. "Sequence Control," by Mr. Hayden.

CARDIFF.—Royal Hotel. Association of Mining Electrical & Mechanical Engineers, South Wales Branch. Annual dinner.

EXHIBITIONS

9th-26th February

LONDON.—Science Museum, South Kensington. Exhibition of French scientific instruments.

20th-24th February

GLASGOW.—Engineering Centre, 351, Sauchiehall Street. British Welding Research Association exhibition, "Research & Production."

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

194[illegible]

8[illegible] British Thomson-Houston Co., Ltd., Petch, T. [illegible] and Liddiard, H. W. C.—Control systems for electrically operated winding gear and the like. 30th April, 1945. (635332.)

12[illegible]9. Submarine Signal Co.—Submarine signalling. 30th June, 1944. (635333.)

12[illegible]4. Stevens, A. H. (Submarine Signal Co.).—Apparatus for submarine signalling. 3rd July, 1944. (Convention date not granted.) (635334.)

17191. Triggs, W. W. (Patelhold Patentverwertungs- und Elektro-Holding Akt.-Ges.)—Device for producing chemical reactions in a flowing gas by means of high-frequency electrical discharges. 8th September, 1944. (635335.)

21022. Submarine Signal Co.—Apparatus for submarine echo ranging. 27th October, 1944. (635337.)

22014. Submarine Signal Co.—Submarine signalling. 8th November, 1944. (635338.)

1945

10245. British Thomson-Houston Co., Ltd.—Gas turbine power plant. 24th April, 1945. (635195.)

19160. British N. S. F. Co., Ltd., and Newman, L. G.—Electrical condensers. 23rd July, 1946. (635198.)

20612. Newton, F.—Regulators for dynamo-electric machines. 21st October, 1947. (635199.)

25232. Sueur, R.—Electrical carrier-wave signalling systems. 28th September, 1945. (635340.)

28391. Compagnie Générale d'Electricité.—Carrier current communication systems. 26th October, 1945. (635341.)

1946

2763. Philco Corporation.—Electrical bridge measuring system. 28th January, 1946. (635205.)

4033. British Thomson-Houston Co., Ltd.—Electric lamps and seals therefor. 8th February, 1946. (635342.)

14442. Bramble, A. E. C. Y.—Servo-motor devices particularly for gyroscopic apparatus. 23rd March, 1945. (Divided out of 635192.) (635210.)

16904. Submarine Signal Co.—Depth sounding apparatus. 4th June, 1946. (635211.)

17498. Joelson, K. E. A.—Automatic control mechanism for working or production machines, e.g., winding machines for electrical armatures. 11th June, 1946. (635212.)

25659. Soc. Francaise Radio-Electrique.—Ultra-rapid radiotelegraphy systems. 27th August, 1946. (635346.)

26477. British Thomson-Houston Co., Ltd.—Caging signal devices for gyroscopes. 3rd September, 1946. (635126.)

28022. Telefonaktiebolaget, L. M. Ericsson.—Thermo-responsive electric switches. 18th September, 1946. (635223.)

28499. Marconi's Wireless Telegraph Co., Ltd.—Beam deflecting circuits for cathode-ray tubes. 24th September, 1946. (635351.)

28746. Pestarini, G. M.—Control systems for dynamo-electric machines of the flywheel equalizer kind. 27th October, 1947. (635059.)

28747. Pestarini, G. M.—Dynamo-electric machines of the metadyne kind. 27th October, 1947. (635060.)

28748. Pestarini, G. M.—Electrical speed-responsive indicating or control means. 27th October, 1947. (635061.)

28749/0. Pestarini, G. M.—Electric traction equipments. 27th October, 1947. (635062/3.)

29209. Minnesota Mining & Manufacturing Co.—Pressure-sensitive adhesive tapes and spliced electrical wire or cable including the adhesive tape. 1st October, 1946. (635127.)

30755. Ferrand, L.—Fused electrolyte cells. 16th October, 1946. (635226.)

31358. Scintilla, Ltd.—Motor-driven reciprocating hand-tool. 22nd October, 1946. (Cognate application 31359, 15th February, 1945.) (635227.)

31830. Hazeltine Corporation.—Tuning indicator system. 26th October, 1946. (635064.)

32043. Standard Telephones & Cables, Ltd.—Radio receiver tone control. 29th October, 1946. (635228.)

33689. Submarine Signal Co.—Fractional frequency generator. 13th November, 1946. (635229.)

34001. Radio Corporation of America.—Radio diversity receiving systems. 15th November, 1946. (635263.)

34147. Marconi's Wireless Telegraph Co., Ltd.—Diversity receiving systems and control circuits for use therein. 18th November, 1946. (635264.)

34319. Conway, H. G. — Electrical control of hydraulically operated apparatus. 9th December, 1947. (635066.)

34958. Radio Corporation of America.—Trigger or locking circuit arrangements. 25th November, 1946. (635265.)

37332. Damond, E.—Electrically heated blankets, trellises, nettings, panels and the like. 18th December, 1946. (635230.)

38129. Westinghouse Electric International Co.—High-frequency transmission systems embodying wave guides. 31st December, 1946. (635131.)

1947

654. General Electric Co., Ltd., and Espley, D. C.—Thermionic valve amplifiers. 25th May, 1949. (635132.)

1129. Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz.—Circuit arrangements for use with television transmitting tubes. 13th January, 1947. (635068.)

1541. Elliott Bros. (London), Ltd., and Hawkes, H. D.—Moving coil iron-cored electrical measuring instruments. 16th January, 1948. (635069.)

1896. British Thomson-Houston Co., Ltd.—Electric multi-circuit connectors. 21st January, 1947. (635357.)

2277. Rumsey, V. H., and Salmon, P. G.—Electric wave filters. 24th January, 1947. (635070.)

2467. Pyrotenax, Ltd., Clothier, G. D., and Fenwick, R.—Electrical heaters. 13th January, 1948. (635233.)

3706. Standard Telephones & Cables, Ltd., Dunn, R. H., and Lennox, P. W.—Electric rate measuring systems. (6th February, 1948. (635072.)

3736. Metropolitan-Vickers Electrical Co., Ltd., and Crowley-Milling, M. C. — High-frequency measuring apparatus. 21st January, 1948. (635235.)

4031. Newman, E. A.—Electric amplifier circuits. 14th January, 1948. (635236.)

5002. Cinema-Television, Ltd., and Head, R. B.—Luminescent materials and methods of making such materials. 19th January, 1948. (635359.)

5044. Marconi's Wireless Telegraph Co., Ltd.—Radar systems. 20th February, 1947. (635073.)

6714. Standard Telephones & Cables, Ltd., and Earp, C. W.—Radio direction finders. 5th March, 1948. (635277.)

7161. Laws, C. A., and Buckingham, J.—Thermionic valve circuits. 14th March, 1947. (635137.)

7993. Sperry Gyroscope Co., Inc.—Couplings or joints between high-frequency electro-magnetic waveguides and coaxial lines. 24th March, 1947. (635364.)

8345. Woods of Colchester, Ltd., and Birtwell, W. G.—Fan runner structure. 11th February, 1949. (635239.)

9313. Philips Lamps, Ltd.—Electrical sound-reproducing devices. 8th April, 1947. (635139.)

9369. Marconi's Wireless Telegraph Co., Ltd.—Automatic tuning mechanism for radio receivers. 9th April, 1947. (635140.)

9469. Metropolitan-Vickers Electrical Co., Ltd., and Carnochan, R.—Air filters. 6th May, 1948. (635076.)
9603. Marconi's Wireless Telegraph Co., Ltd., and Peat, J. D.—Omni-directional radio range beacons. 18th December, 1947. (635282.)
10687. British Thomson-Houston Co., Ltd., and Edinborough, E. R.—Electric lamp fittings. 15th April, 1948. (635142.)
11466. British Thomson-Houston Co., Ltd.—Compositions prepared from oil-modified alkyd resins. 29th April, 1947. (635286.)
11879. General Electric Co., Ltd., and Espley, D. C. Electrical networks for echo correction in electrical signalling systems. 15th April, 1948. (635287.)
12234. Bendix Aviation Corporation.—Housing suitable for an electric switch. 6th May, 1947. (635081.)
15153. Dawe, F. W.—Tuning mechanism for wireless receivers. 9th June, 1948. (635145.)
16219. General Electric Co., Ltd., Clayton, R. J., and Espley, D. C.—Tuning stubs for electrical oscillations. 22nd October, 1948. (635244.)
16436. Automatic Telephone & Electric Co., Ltd., Isterling, J., and Beale, C. E.—Telephone systems. 21st June, 1947. (635370.)
16651. English Electric Co., Ltd., and Ferguson, J. M.—Electric circuits comprising electric-discharge devices. 24th June, 1948. (635147.)
17588. Hazeltine Corporation.—Electrical measuring system. 3rd July, 1947. (635090.)
18909. Westinghouse Electric International Co.—Electric catapults and control systems therefor. 16th July, 1947. (635296.)
21023. Standard Telephones & Cables, Ltd.—Television transmission system. 1st August, 1947. (635300.)
21087. Sylvania Electric Products, Inc.—Crystal contact rectifiers. 1st August, 1947. (635251.)
22082. Sylvania Electric Products, Inc.—Non-stroboscopic discharge-lamp units. 8th August, 1947. (635304.)
22087. Sylvania Electric Products, Inc.—Fluorescent lighting fixture. 8th August, 1947. (635100.)
22687. Standard Telephones & Cables, Ltd., Ridler, D. S., and Walsh, W. A. G.—Mounting arrangements for discharge-tubes. 13th August, 1948. (635305.)
23860. Metropolitan-Vickers Electrical Co., Ltd.—Apparatus for the photographic recording of X-ray images. 28th August, 1947. (Cognate application 23861, 19th July, 1944.) (635377.)
25872. General Electric Co., Ltd., Espley, D. C., and Clayton, R. J.—Electrical networks for echo and like correction in electrical signalling systems. 16th April, 1948. (635381.)
26501. General Electric Co., Ltd., and Hubbold, S.—Picture lighting apparatus. 5th October, 1948. (635312.)
27234. Matemine.—Electrically actuated stop-block for mine-cars. 10th October, 1947. (635382.)
27405. Standard Telephones & Cables, Ltd., Ormrod, D. H., and Wilson, M. T.—Telephone exchange systems. 8th October, 1948. (635383.)
28221. Shardlow Electric Wires, Ltd., and Hargreaves, L. S.—Display stand for reels of electric cable or the like. 25th August, 1948. (635384.)
28771. Marconi's Wireless Telegraph Co., Ltd., and Moon, J. H.—Magnetic compasses and correction devices therefor. 5th July, 1948. (635108.)
29304. General Electric Co., Ltd., and Douglas, R. W.—Methods of manufacturing crystal contact devices. 15th October, 1948. (635385.)
29498. Standard Telephones & Cables, Ltd., and Feldhusen, J. V.—Light-beam indicating systems. 5th November, 1948. (635170.)
32994. Bickell, S. F.—Cookers, ovens, refrigerators and like cabinets. 15th December, 1948. (Cognate application 11396, 26th April, 1948.) (635178.)
34217. Sterental, V.—Electric rotary furnaces. 24th December, 1947. (635321.)

1948

6651 Pye, Ltd., Lord, A. V., and Lax, L.—Instrument for measuring or indicating the characteristics of electric pulses. 3rd March, 1949. (635186.)
11309. Clifton Aircraft, Ltd., and Langstone, W. H.—Electric coupling sockets. 12th March, 1949. (635189.)
11310. Clifton Aircraft, Ltd., and Langstone, W. H.—Internal wiring of electric cookers. 14th April, 1949. (635190.)
21386. Triggs, W. W. (Patelhold Patentverwertungs & Elektro-Holding Akt.-Ges.).—Device for producing chemical reactions in a flowing gas by means of high frequency electrical discharges. 8th September, 1944. (Divided out of 635335.) (635398.)
29048. Morris Motors, Ltd., and Bridle, J. H.—High-frequency induction heating apparatus. 6th October, 1949. (635360.)

Capacitor Voltage Transformer

VOLTAGE transformers of the normal electro-magnetic type are quite expensive at 33 kV, and for 66 or 132 kV and above their cost is extremely high. For this reason the number of voltage transformers connected to systems operating at such voltages is reduced to the minimum and often to an extent which causes serious inconvenience from the operating point of view.

It is possible that an appreciable saving in cost could be made by adapting as an alternative the device known as a capacitor transformer, so the E.R.A. has carried out experimental work which has resulted in the publication of a technical report (ref. Q/T104) by Dr. E. Billig. This contains a mathematical analysis of the performance of a capacitor transformer, as used for supplying small power loads from a source of high voltage, and indicates the possible adaption of the device as a voltage transformer.

Comments from engineers interested in this possible development would be appreciated by the British Electrical and Allied Industries Research Association, Thorncroft Manor, Dorking Road, Leatherhead, Surrey, from whom the report is available price 12s, postage 3d.

Belgian Centenary

ON the occasion of its centenary last year the Association of Engineers of the University of Liège organized a congress, the main purpose of which was to define the future of Belgian industry over a period of fifty years. Some seven hundred specialists from all branches of engineering were in attendance and the meetings, which extended over a period of fifteen days, were held on the campus of the School of Engineering of the University. A large number of papers were read and these have now been published in 23 volumes, thereby constituting what is to all intents and purposes an encyclopædia of modern engineering practice and research. The Association has also published a brochure describing these volumes and quoting their respective prices. Interested persons should apply to the Association des Ingénieurs sortis de l'Ecole de Liège, 12, Quai Paul van Hoegaerden, Liège, Belgium.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section, the date of the issue is given in parentheses.

Argentina.—BUENOS AIRES.—13th March. Water Works Department, Ministry of Public Works. Electrical pumping equipment, l.v. switchboards and Venturi meters. (C.R.E. (I.B.) 42990/50. Ten/986.)*

Barnley.—24th February. Corporation. Electric installation in the extension to the Townley Technical High School for Boys. (See 10th February issue.)

Coulsdon and Purley.—1st March. U.D.C. Fluorescent lighting fittings for Council offices. (See this issue.)

Cuckfield.—27th February. R.D.C. Installation of electricity in Council houses. (See 10th February issue.)

East Lothian.—14th March. Water Board. Four electrically driven surface pumps for Whiteadder supply. G. H. Hill & Sons, engineers, 81, Mossley Street, Manchester, 2.

Keighley.—11th March. Corporation. Electrically driven booster pumping plant for the Waterworks Department. G. E. V. Boldry, waterworks engineer, Martins Bank Chambers.

Manchester.—10th March. Education Committee. Electrical installation in Old Hall Drive Secondary School, Gorton. (See this issue.)

24th March. Electrical engineering work at the Municipal College of Technology. (See 10th February issue.)

New Zealand.—WELLINGTON.—9th May. State Hydro-Electric Department. One 25-ton electric overhead travelling crane. (C.R.E. (I.B.) 42173/50. Ten/966.)*

South Africa.—CAPE TOWN.—14th March. City Electricity Department. Overhead line material. (C.R.E. (I.B.) 42733/50. Ten/979.)*

16th March. Bare copper conductors and insulated copper conductors. (C.R.E. (I.B.) 42732/50. Ten/978.)*

Uruguay.—MONTEVIDEO.—2nd March. Usinas Electricas y Telefonos del Estado. Three groups of control gear for 2,100 kVA diesel, electric generators. (C.R.E. (I.B.) 42252/50. Ten/971.)* 24th March. Sub-station equipment. (C.R.E. (I.B.) 42245/50. Ten/984.)*

20th March. Supply of 18,000 telephone dry batteries. (C.R.E. (I.B.) 42120/50. Ten/972.)*

22nd March. Supply of 76,400 metres of 6,000 V and 132,200 metres of 220 V armoured underground cables. (C.R.E. (I.B.) 42122/50. Ten/968.)*

Willenhall.—13th March. U.D.C. Supply of electric lamps for one year. Surveyor, Town Hall.

*Specifications may be inspected at the Commercial Relations and Exports Department, Board of Trade, Thames House North, Millbank, S.W.1 (Victoria 9040).

ORDERS PLACED

Durham.—County Education Committee. Electrical installation at Hebburn Quay County School (£1,250).—Hartley Electromotives.

London.—County Council Housing Committee. Installation of wiring and fittings for electricity in 345 dwellings at Downham estate, Lewisham (£6,432).—London Electricity Board (Southern Sub-Area).

South Shields.—Town Council. Electric starter for plenum heating and ventilating system at Dean Road County Secondary School (£110). —North Eastern Electricity Board. Wiring for broadcast reception in 17 school departments for the Education Committee (£230).—Law & Burns.

Whitley Bay.—U.D.C. Electrical installations in 18 houses.—Mood and Sons.

CONTRACTS IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Bexhill.—Houses (70), Southlands Avenue; borough surveyor.

Bilston.—Works extensions; Joseph Sankey & Sons, Ltd., Albert Street Works.

Birkenhead.—Extensions and alterations at Bridge Street for Metallic Valve Co., Ltd.; R. Owens & Sons, architects, 11, Westminster Chambers, Liverpool.

Birmingham.—Primary school, Garretts Green; Harvey & Wicks, architects, 117, Hagley Road.

Blackburn.—Houses (44), Higher Croft estate; borough surveyor.

Bournemouth.—Day nursery, Linden Road; borough architect.

Flats (20), Belle Vue Road; Reynolds, Tomlins & Dexter, Granville Chambers, Yelverton Road.

Bradford.—Nursery teachers' training college, Easby Road; Margaret McMillan Memorial Fund, 90, Ebury Street, S.W.1.

Brierley Hill.—Dwellings (60), Market Street, Kingswinford; J. R. Moore, housing director, Moor Street.

Brighton.—Development of Happy Valley housing estate, Patcham; Braybons, Ltd., Regent House, Princes Place.

Bristol.—Fire headquarters and extensions to police station; J. B. Bennett, city engineer, College Fields, Clifton.

Bromley.—Dwellings (72) and six shops, Coppice estate; borough engineer, Municipal Offices.

Chatham.—Blocks of flats, Jenkins Dale; borough engineer.

Chelmsford.—Works extensions; Hoffman Manufacturing Co., Ltd., New Street.

Chesterfield.—Houses (92), Newbold estate; W. S. Wilson, borough surveyor.

Dagenham.—Five blocks of three-storey flats, Dagenham Road; Evans Bros. (Romford), Ltd., 98, Dagenham Road, Romford.

Beer bottling factory, Selinas Lane; Charrington & Co., Ltd., Anchor Brewery, Mile End Road, E.1.

Edmonton.—Factory and warehouse, Angel Road, for H. Gadsdone, Ltd., 47, Crispin Street, E.1; A. E. Symes, Ltd., builders, Carpenters Road, E.15.

Hull.—Block of offices and workshops, south side of Fish Dock, for St. Andrew's Steam Fishing Co.; J. Watson & Carter, architects, Bowl-alley Lane, Hull.

Lancashire.—Extensions to Broadoak county infants' school and a new school at Norman Road, Stalybridge; G. Noel Hill, county architect, Preston.

Liverpool.—Conversion of Ordnance factory hostel into 145 flats for T.C.; Marshall Bros., Liverpool.

Macclesfield.—Fire station, Thomas Street; borough surveyor.

Manchester.—Nursery wing at Charlestown primary school, Blackley (£15,415); city architect.

Y.M.C.A. hostel at Demesne Road; H. S. Fairhurst & Son, architects, 55, Brown Street, Manchester.

Houses (16), French Barn Lane, Blackley, for Wilbraham Building Co.; H. Hankinson, architects, 3, The Downs, Altrincham.

Middlesbrough. — Houses (26), Ullswater Avenue, etc.; Dean Brothers, builders, Longlands Road.

Morley.—Houses (30), Vicarage Avenue, Gildersome; M. H. Brook, housing director, Queen Street.

Newbury. — Houses (82), Shaw estate; borough surveyor.

Newcastle-under-Lyme.—Houses (49) and 12 maisonnettes, Bursley Way; Madew & Wardle, Ltd., builders, Central Works, Market Lane.

Newcastle-on-Tyne.—Six police section stations for the City Council (£30,000); city architect, 18, Cloth Market.

Northampton.—Three blocks of flats, Horsemarket; borough architect.

Norwich.—Secondary modern school, Lakenham (£161,095); city architect.

Oakengates.—Houses (50) for U.D.C.; M. S. Lee, surveyor, Council Offices, Stafford Road.

Oldham.—Houses (24), Limeside estate; Unit Construction Co., Ltd., Knutsford, Ches.

Penrith.—Houses (54), Scaws estate; borough surveyor.

Portland.—Houses (94), Verne Common; U.D.C. surveyor.

Reading.—Three-storey blocks of flats, Gosbrook Road, Caversham; James & Bywaters, architects, 5, Bloomsbury Street, W.C.1.

Offices, showrooms and repair shop; John Wilder, Ltd., The Cattle Market.

Salford.—School, Duke Street; Cruickshank & Seward, architects, 16, Princess Street, Manchester.

Scunthorpe.—Police buildings and magistrate's courts, for Lindsey C.C.; C. B. Pearson & Son, architects, 18, Dalton Square, Lancaster.

Sheringham.—Houses (72), Common Lane; U.D.C. surveyor.

Southport.—Hosiery factory, Crossens; Hartwood Hosiery Co., Ltd., 1, Hartwood Road.

South Shields.—Flats (108), Prince Edward Road, for the T.C.; William Leech, Ltd., builders, 2, Clayton Street, Newcastle-on-Tyne.

Startforth.—Houses (20), Cotherstone and Mickleton; H. B. Richardson, R.D.C. architect, Skinnergate, Darlington.

Stockton-on-Tees. — Crematorium, Durham Road (£30,000); borough architect, The Square.

Stoke-on-Trent.—Foundry extensions; Jesshope, Ltd., Orford Street, Longport.

Stornoway.—Ice plant building for Herring Industry Board; Sir Alexander Gibb & Partners, consulting engineers, 43, Northumberland Street, Edinburgh.

Stretford.—Houses (34) and four blocks of flats, Christie Road; borough engineer.

Sunderland. — Central ambulance depot; borough architect.

Occupation centre for mental defectives (£20,000); H. C. Bishop, borough architect.

Sutton & Cheam.—Flats (39), Malden Road, Cheam, and Stonecot Hill, Sutton; borough engineer, High Street, Sutton, Surrey.

Taunton.—Bus station, offices, etc., Tower Street; Western National Omnibus Co., Ltd., 48, Queen Street, Exeter.

Ulverston.—Houses (24), Lane House site, for U.D.C.; Baker & Foster, 2, Upper Brook Street.

Watford.—Factory, Station estate, Balmoral Road; British-American Optical Co., Ltd., 24, Hatton Garden, E.C.1.

Wellington.—Houses (50) for R.D.C.; J. T. Adams, Walker Street, Wellington, Salop.

Winchester. — Secondary school, Romsey Road; county architect, The Castle, Winchester.

Windermere.—Houses (20), Oldfield estate, for U.D.C.; Walker, Carter & Walker, architects, Crescent Road.

Wrexham.—Building for arts centre (£75,000); J. M. Davies, borough surveyor, 31, Chester Street.

Cables in Mines

AT Liège recently Mr. T. B. Parker, chief rubber technologist to Johnson & Phillips, Ltd., gave a lecture to the mining section of the Association des Ingénieurs Électriciens Sortis de l'Institut Électrotechnique Montefiore. The subject of the talk was rubber insulated trailing cables and aluminium sheathed shaft cables, and with the discussion which followed it lasted nearly 3½ hours. The audience showed great interest in the new aluminium sheathing and particularly in the advantage to shaft cables resulting from the increased strength and lightness of aluminium. The A.I.M. is having the lecture printed for distribution to its members.